SHOUT
SHARE
IT

P/62 2/3 7412

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Vol. XIX 1924

1872

Smithsonian Institution
280163
FEB 26 1925
National Museum

EDITED (IN SUCCESSION) BY

F. G. SCHAUPP JOHN B. SMITH GEO. H. HULST
CHAS. LOUIS POLLARD R. P. DOW J. R. de la TORRE-BUENO

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, *Editor*
G. P. ENGELHARDT J. BEQUAERT

PRESS OF
THE SCIENCE PRESS PRINTING COMPANY
LANCASTER, PA.

g Insects

INDEX TO VOLUME XIX.

(Arranged alphabetically throughout.)

Subjects and Authors.

GENERAL SUBJECT.

- A Bird in a Spider Web, Stanley W. Bromley, 52.
- Book Notes, J. R. T.-B., 26.
- Book Notes, "Histoire Naturelle des Moustiques de France," J. Bequaert, 155.
- Editorials: Entomology in Non-entomological Publications, J. R. T.-B., 54.
  - On "N. Sp.," J. R. T. B., 99.
- Galls that Secrete Honeydew: A Contribution to the Problem as to Whether Galls are Altruistic Adaptations, J. Bequaert, 101.
- George Franck, W. T. Bather, 1.
- Latter Day Horismology: A Review, H. M. Parshley, 95.
- Notes on the Relationships Indicated by the Mandibles of Certain Holometabolous Insects, G. C. Crampton, 157.
- Proceedings of the Society, 196.
- Studies on the Blood of Insects: II—The Structural Elements of the Blood, R. A. Muttkowski, 4. III—The Coagulation and Clotting of Insect Blood, R. A. Muttkowski, 128.
- The Next of Kin, J. R. Malloch, 195.

COLEOPTERA.

- *Agrilus viridis* in Massachusetts, C. A. Frost, 27.
- *Chrysobothris virdigripennis* in Canada, C. A. Frost, 34.
- *Diabrotica tricincta* Say Injurious in New Mexico, F. H. Chittenden, 184.
- Distribution of *Epilachna corrupta* Muls., F. H. Chittenden, 3.
- *Dorytomus frosti,* C. A. Frost, 37.
- Ecological Observations on Rhynchophora in Southern Pines, N. C., A. H. Manee, 40.
- Note on *Anamorphus,* Charles Dury, 25.
- On *Casnonia picta* Chaudoir and *C. suturalis* Chaudoir, Charles Schaeffer, 147.
- *Parallelina saucia,* C. A. Frost, 34.
- The Parsley Weevil (*Listronotus latiusculus* Boh.) a Potential Pest, F. H. Chittenden, 84.
- The Return of *Leptinotarsa juncta* Germ. to the District of Columbia, F. H. Chittenden, 37.

DIPTERA.

A New North American Species of *Amiota* Loew, J. R. Malloch, 51.

The Crane Flies of New York: Second Supplementary List, Charles P. Alexander, 57.

The North American Species of the Genus *Meromacrus,* with One New Species, James S. Hine, 20.

HETEROPTERA.

A Correction in *Acalypta,* J. R. de la Torre-Bueno, 93.

A New *Enicocephalus,* Stephen C. Bruner, 39.

A New North American Species of *Microvelia,* Roland F. Hussey, 164.

A New Species of *Acanthocheila* from Bolivia, Carl J. Drake, 94.

A Preliminary Survey of the Species of *Microvelia* Westwood of the Western World, with Description of a New Species from the Southern United States, J. R. de la Torre-Bueno, 186.

Atractotomus mali (Meyer) Found in Nova Scotia, H. H. Knight, 65.

Biological Note on *Plea striola* Fieber, J. R. de la Torre-Bueno, 146.

General Catalogue of the Hemiptera, H. M. Parshley, 154.

Note on *Aradus debilis* Uhler, H. M. Parshley, 145.

On a Few Heteroptera from Massachusetts, J. R. de la Torre-Bueno, 48.

On the Curious Halophilus Water Strider *Halovelia maritima* Bergroth, Teiso Esaki, 29.

Some Annectant Bugs of the Superfamily Cimicoidea, W. L. McAtee and J. R. Malloch, 69, 127.

Two New Species of *Cymus,* H. G. Barber, 87.

Winter Food for Waterbugs in Aquaria, William E. Hoffman, 149.

HOMOPTERA.

Distributional Notes on Hemiptera (No. 2): Homoptera Cicadellidae, Chris E. Olsen, 151.

The Seventeen Year Cicada on Long Island, with Particular Reference to Its Appearance in 1923, Wm. T. Davis, 182.

HYMENOPTERA.

A New Species of the Genus *Brachycistus* Fox, J. R. Malloch, 23.

Oak Apple Galls Destroyed by Gray Squirrels, Wm. T. Davis, 91.

Systematic Position of Dasygastrae, Charles Robertson, 180.

Two Mutillids Hyperparasitic on White Grubs, Wm. P. Hayes, 153.

LEPIDOPTERA.

A New Locality for *Copaeodes minima* Edwards, E. L. Bell, 43.
A New Locality for *Pamphila meskei* Edwards, E. L. Bell, 86.
A New *Oiketicus* from Texas, Wm. Barnes and F. H. Benjamin, 24.
An Interesting New *Papilio* from Saghalien, Waro Nakahara, 38.
A Revision of the Genus *Basilarchia,* Waro Nakahara, 166.
California Butterfly Notes, II, Karl R. Coolidge, 44.
Collecting Notes, E. L. Bell, 163.
Eastern Records for *Tornos scolopacinarius* Guénée, E. L. Bell, 124.
Field Notes on the Western Clear Wing Moths (Aegeriidae), G. P. Engelhardt, 125.
Libythea bachmani on Long Island, E. L. Bell, 43.
Note on *Papilio ajax marcellus,* W. P. Rogers, 127.
The Saturniid Moth *Coloradia pandora* a Menace to Pine Forests and a Source of Food to Indians in Eastern Oregon, G. P. Engelhardt, 35.

THYSANOPTERA.

A New *Ankothrips* from New Mexico, J. Douglas Hood, 66.

INDEX TO GENERA AND SPECIES OF INSECTS, OTHER ANIMALS AND PLANTS.

New forms in **bold face**; valid genera and species in Roman; synonyms in *italics;* † indicates Long Island records; * indicates plants; ‡ indicates animals.

(For sundry genera and species, see The Blood of Insects, pp. 4–19 and 128–144; for North Carolina Coleoptera, see pp. 40–43; for food plants of California butterflies, see pp. 44–47; for list of Heteroptera from Massachusetts, see pp. 48–51; for list of Crane flies of New York, see pp. 57–64; genera and species recorded in these not indexed.)

Acalypta cooleyi, 51, 93
  lillianis, 51, 93
  modesta, 93
  thomsonii, 50, 93
Acanthia intrusa, see Isometopus
Acanthocheila **tumida**, 94
Acanthopsyche opacella, 116, 117
Acucephalus flavostrigatus, 151
Aëpus, 32
Agrilus viridis, 27
† Alaus myops, 196
† Alaus oculatus, 196
Albuna pyramidalis, 126
Alcecoris, 75, 80
  periscopus, 81
Amblychila piccolomini, 148
Amiota **setigera**, 51
  humeralis, 51, 52
Amphibolips confluens, 91, 92
Anamorphus, 25
Ancistrocerus kisangani, 115
Andricus attractans, 104
  gemmarius, 103
  lucidus, 102, 108
  mayri, 102
  panteli, 102
  ramuli, 102, 108
  seckendorffi, 102
  seminator, 104
  sieboldi, 102, 103, 108
Ankothrips **diffractus**, 67
  fissidens, 66
  niezabitowski, 66
  robustus, 66
Anthocharis, 197
Aradus debilis, 145, 146
‡ Aranea trifolium, 53
Arctocorisa antigüensis, 26
‡ Argiope cophinaria, 53
Atractotomus magnicornis, 65
    var. buenoi, 65
  mali, 65
† Atrytonopsis hianna, 163

Balaninus, 91
Basilarchia archippus, 166, 167, 176
  var. archippus
    ab. advena, 178
    ab. lanthanis, 178
    ab. pseudorippus, 177
  var. floridensis, 178
    ab. *cayuga,* 178
    ab. halli, 179
    ab. *nigricans,* 179
    form nig, 178
  arthemis, 166, 167
    var. albofasciata, 170
      ab. **benjamini**, 171
    var. arizonensis, 174
    var. arthemis, 167 et seqq.

      ab. rufescens, 169
      ab. arthechippus, 169
    var. astyanax, 171
      form atlantis, 173
        inornata, 174
        viridis, 173
      ab. cerulea, 173
      ab. rubidus, 173
    var. prosperpina, 169
    var. rubrofasciata, 169
  dissipus, 177
  hulsti, 179
  lorquini lorquini, 175 et seqq.
      ab. eavesii, 176
    var. burrisoni, 176
  obsoleta, 179
  weidemeyerii, 167, 174
    var. nevadae, 175
    var. sinefascia, 175
    var. weidemeyerii, 174
      form angustifascia, 175
Belostoma impavidum, 26
Bilia fracta, 81
Bittacus, 163
Brachycistus (Brachycistellus) **inermis**, 23
  paupercula, 23
Brenthis alberta, 197
  astarte, 197
Buenoa albida, 26

Callianira (see Basilarchia)
  ephestiaena, 167, 171
Callirhytis balanaspis, 106
  balanoides, 106
  balanopsis, 106
  balanosa, 105
  carmelensis, 106
  congregaria, 105
  gemmaria, 104, 105
  perditor, 106
Casnonia pennsylvanica, 147
  picta, 147
  suturalis, 147
Camponotus americanus, 105
  castaneus subsp. americanus, 105
  sexguttatus, var. antiguensis, 26
      montserratensis, 26
      unitaeniatus, 26
    subsp. basirectus, 26
Cephalocoris, 76
* *Ceanthus* (Ceanothus), 40
* Cerocarpus montanus, 68
Ceromasia inclusa, 115, 116
Chrysobothris virdigripennis, 34
* Chrysoplenium, 60
Cicada, 182 et seqq.
  casinii, 182 et seqq.
Cincindela punctulata, 197
  sexguttata, 197
Coloradia pandora, 35, 196
Copaeodes minima, 43
  rayata, 43
Corticoris, 75; 77
  liberatus, 79
  libertus, 79
  media, 78
  pulchellus, 78, 79
  signatus, 79, 80
  unicolor, 78, 79
Corydalis cornutus, 163
* Cucurbita foetidissima, 185
Curicta, 150
Cymus angustatus, 88, 89
  bellus, 89
  breviceps, 89
  discors, 90
  exiguum, 89
  guatemalanus, 88, 89
  luridus, 87, 90
  reductus, 88, 90
  † **robustus**, 87, 90
  virescens, 89
Cynips calicis, 103, 109
  coronaria, 103
  glutinosa, 103
  insana, 103

    kiefferi, 103
    mayri, 103, 108
    panteli, 104
    quercus mellaria, 106
‡ Cyrene graciosa, 26

Danaus archippus, 199
Dasymutilla permista, 153
Dendroscirtus, see Corticoris
Dermatobia, 156
Diabrotica 12-punctata, 185
    nitida, 185
    tricincta, 184
    vittata, 185
Diachus auratus, 196, 199
    catarius, 199
    pallicornis, 196, 199
Dicranothrips, 66
Diphleps, 70, 71, 73
    unica, 73, 74
Diplolepis gallae umbraculatae, 104
    gallae viscosae, 104
    quadrum, 104
    quercus tojae, 104
Diprion pallidum, 115
    variegatum, 115, 116
Disholcaspis chrysolepidis, 107
    eldoradensis, 107
    monticola, 106
    perniciosus, 106
Doldina antiguensis, 26
Dorytomus frosti, 37
Drosophila, 149
Dryocosmus cerriphilus, 104
    mayri, 104

* Elaeoselinum fontanesii, 107
Elephantomyia westwoodi, 96
Elis quinquecincta, 153
    sexcincta, 153
Enicocephalus **dominicus,** 39
Epilachna corrupta, 3
Euphydryas chalcedona, 45
Eurocrypha thanatochlamys, 81
‡ Eurythroe pacifica, 26
† Eutolype rolandi, 199

Frankliniella fusca, 68

Gaea solitaria, 127
Gnophomyia tristissima, 96

Halobatodes, 32
Halovelia maritima, 29 et seqq.
Heidemannia, 74, 76
    cixiiformis, 77
Helops **carolina,** 40

Idiotropus, 70, 127
    gagates, 71
    tristis, 127
* Impatiens, 59
Isometopus, 75, 76, 127 (see also Corticoris)
    alienus, 75
    feanus, 82
    intrusa, 75, 76
    lieweni, 82

Jehania mahal, 81

Lasioptera carophila, 108
Leptinotarsa juncta, 37
    10-lineata, 37
‡ Leptotrombidium, 33
Libythea bachmani, 43
Lidopus, 75, 77, 127
Limenitis (see Basilarchia, 166 et seqq.)
    arthemis, 167, 169
    ephestion, 173
    eros, 178, 179
    hulsti, 179
    lorquini, 176
    misippus, 178
    obsoleta, 179
    ursula, 170, 171, 173, 174
Listronotus latiusculus, 84

Macronema, 163

* Massospora cicadina, 182
Melampsaltra calliope floridensis, 196
  kansa, 196
Melasoma interrupta, 197
  tremulae, 197
Melitaea, 197
  gabbi, 45
Melitoma, 181
Mellitia gloriosa, 125, 196
Meromacrus *ania,* 21
  cinctus, 20, 21
  cruciger, 20, 21
  crucigera, 21
  decorus, 20, 21
  milesiformis, 21
  obscurus, 20, 21, 22
  opulentus, 20, 22
  pinguis, 21
  pratorum, 20, 22
  ruficrus, 20, 22
  zonatus, 20, 23
Mesotrichia, 114
Metrocoris sp. (see Halovelia), 30
* Micrampelis, 125
Microbracon sp., 86
Micropteryx, 158
Microvelia, 149, 186, 193
  albonotata, 187 et seqq.
  americana, 164, 165, 187, 190, 194
  atrata, 187 et seqq.
  austrina, 187 et seqq.
  borealis, 187 et seqq.
  buenoi, 187 et seqq.
  capitata, 187 et seqq.
  circumcincta, 187 et seqq.
  flavipes, 187 et seqq.
  fontinalis, 187 et seqq.
  gerhardi, 164, 165, 187 et seqq.
  hinei, 187 et seqq.
  incerta, 187 et seqq.
  insignis, 187 et seqq.
  longipes, 187 et seqq.
  marginata, 187 et seqq.
  mimula, 187 et seqq.
  modesta, 187 et seqq.
  paludicola, 187 et seqq.
  panamensis, 187 et seqq.
  pulchella, 186 et seqq.
  robusta, 187 et seqq.
  rufescens, 191, 194
  setipes, 187 et seqq.
  signata, 187 et seqq.
  stellata, 187 et seqq.
  torquata, 187 et seqq.
  vagans, 187 et seqq.
Miranda aurantia, 53
Molophilus **cramptoni,** 61
  quadrispinosus, 62
Monomorium (Xeromyrmex) salomonis subsp. subopacum, 26
Montezumia amaliae, 114
Myiomma, 76
  fieberi, 76
Myrmecocystus mexicanus var. hortideorum, 106

Nemoptera, 160
  sinuata, 163
Nepa, 150
† Nephila, 53
Nesocrypha corticicola, 82
Neuroterus vernus, 107
Nortonia *acarophila,* 115
  bisuturalis, 114
  braunsii, 115
  caffra, 115
  gambiensis, 115
Nymphalis disippe, 176

Odynerus pedestris, 115
Oiketicus abbotti, 24
  bonniwelli, 24
  townsendi, 24
Okanagana viridis, 196
Orthotylus **althaeae,** 165
  delicatus, 165
‡ Oxypeidon maculipes, 26

Paloniella, 82
Pamphila meskei, 86
Panorpodes, 163
Papilio (see also Basilarchia)
  ajax marcellus, 127
  astyanax, 171
  bianor **paradoxa**, 38
    form *japonica*, 38
  ephestion, 171
  lamina, 168
  maackii, 38
  machaon *sachalinensis*, 38
    septentrionalis, 38
  missipus, 177
  ursula, 171
  zelicaon, 44
Parallelina exigua, 34
  saucia, 34
Parnassius clodius, 197
  smintheus, 197
Passimachus californicus, 148
Peritropis, 69 et seqq.
  husseyi, 72, 73
  saldaeformis, 72, 73
  tuberculatus, 71, 72
* Petalostemum corymbosum, 41
† Phlepsius franconianus, 151
  incisus, 152
  maculatus, 152
  tenessa, 152
† Phyllophaga, 153
† Pieris rapae, 199
Pilophorus perplexus, 65
Platymetopius cuprescens, 151
  hyalinus, 151
Plea striola, 146
Plectromyia, see Rhaphidolabis
‡ Prionolaena gracilis, 26
Prionothrips, 66
Prochelostoma philadelphi, 181
Psallus delicatus, 165
‡ Pseudosparianthus antiguensis, 26

* Quercus agrifolia, 105, 106
  chrysolepis, 107
  coccinea, 105
  dumosa, 107
  durata, 107
  ilicifolia, 93, 106
  lobata, 107
  macrocarpa, 107
  marilandica, 106
  nana, 106
  tinctoriae, 104
  undulata, 106
  velutina, 91, 92, 104, 105, 106
  wislizeni, 104, 105, 106

Ranatra, 150
Raphidia, 159
Rhaphidolabis (Plectromyia)
    confusa, 63
  forceps, 63
Rhipiphorus, 158
  dimidiatus, 163
Rhodites rosae, 104
* Rhus typhina, 40
* Rosa canina, 104
  * rugosa, 27
Rymbus minor, 25

Sabatinca, 160, 163
* Sagittaria, 42, 86
Sialis, 160
‡ Sidusa stoneri, 26
Skapana typica, 81
* Solanum carolinense, 37
Solenius interruptus, 115
Somatochlora filosa, 198
  linearis, 198
  provocans, 198
  † tenebrosa, 198
Sophianus, 75, 127
  alces, 77
  heidemanni, 77
  schwarzi, 77

‡ Sossipus insularis, 26
* Solanum carolinense, 37
Sphecius speciosus, 125
Sphex, 163
Sphinx franckii, 2
‡ Spizella pusilla, 52
Sturmia bimaculata, 115, 116
Synanthedon aceri, 126
    americana, 126
    frageria, 126
    tacoma, 125, 126

Tabanus, 163
Tenebrio molitor, 149
Teratodia emoritura, 73
Thamnotettix eburatus, 152
† Tornos scolopacinarius, 124
Tribolium, 149
* Tsuga, 65
Turnebiella pallipes, 82
Turnebus (see Isometopus) cuneatus, 76

Velia, 149, 186

Xyela, 159

Wetmorea, 75, 80
    notabilis, 80

New Genera in this Volume, 2.
New Species, Subspecies and Varieties in this Volume, 24.

XIX FEBRUARY, 1924 No. 1

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Smithsonian Institution
MAR 4 1924
National Museum

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO,
Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published by the Society

Price, 35 cents Subscription, $1.50 per year

Mailed February 29, 1924

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1923

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
J. BEQUAERT

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
HOWARD NOTMAN

CONTENTS

GEORGE FRANCK, Bather 1
DISTRIBUTION OF EPILACHNA CORRUPTA, Chittenden 3
STUDIES ON THE BLOOD OF INSECTS—II, Muttkowski 4
THE N. AM. SPECIES OF MEROMACRUS, Hine 20
NEW SPECIES OF BRACHYCISTUS, Malloch 23
A NEW OIKETICUS FROM TEXAS, Barnes and Benjamin 24
NOTE ON ANAMORPHUS, Dury 25
BOOK NOTE, J. R. T. B. 26
SPECIAL NOTICE TO AUTHORS 27
AGRILUS VIRIDIS IN MASSACHUSETTS, Frost 27

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

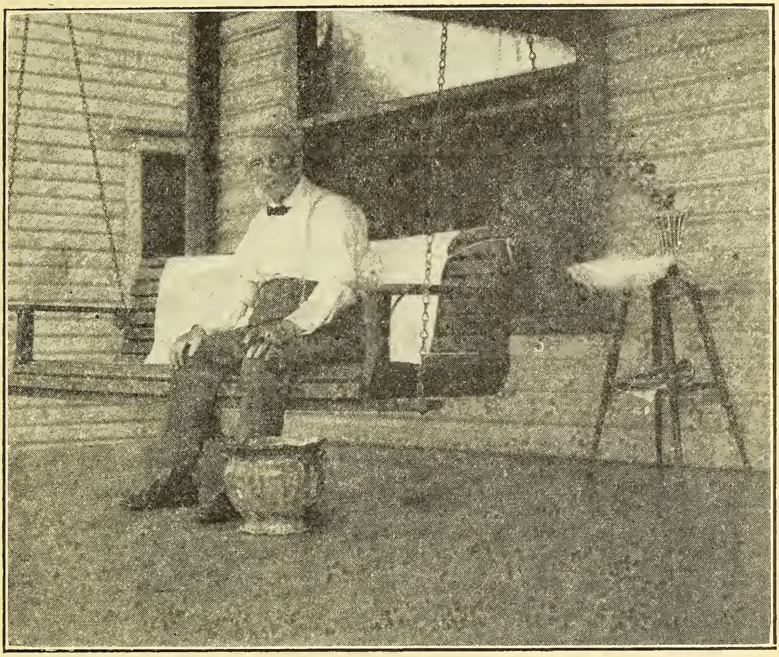
J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XIX February, 1924 No. 1

GEORGE FRANCK.

By W. T. Bather.



Our Old Friend George Franck at St. Petersburg.

George Franck was born in Frankfurt-on-the-Main, Germany, in the year 1839, and died in St. Petersburg, Florida, October 15, 1923, aged 84 years.

At the age of twenty he came to this country, and having an inborn love for nature and a keen appreciation of its possibilities, he became interested in entomology and succeeded in building up a fine collection of the Lepidoptera of the world.

As travelling salesman for commercial houses he was enabled to collect on his trips, and added many rare species to his collection. *Sphinx franckii,* named after him, is one of his discoveries.

After travelling for a number of years, he decided to settle down, and established an entomological business, under the name the The American Entomological Company, which contrary to the opinion of his friends he thought had a great future in this country. The first years proved a hard struggle. Like Benj. Franklin he believed, " If time be of all things the most precious, wasting time must be the greatest prodigality," and he could be found working in his study from early morning till late at night, His industry finally placed the business on a paying basis.

Many years collecting and dealing in insects, he became not only an authority on Lepidoptera, but his knowledge in other orders was esteemed by his contemporaries.

The revival of the old Brooklyn Entomological Society, which had been dormant for a number of years, was mainly due to his efforts. Meetings were held at his place, first in Dekalb Avenue, and later in Stuyvesant Avenue, Brooklyn, N. Y. He was always on the alert to make the evenings pleasant for all, and those happy gatherings will never be forgotten by those who attended.

Mr. Franck managed the Entomological Company for fifteen years and then sold out to Ward's Natural Science Establishment, of Rochester, N. Y. In the evening of life, having passed the milestone of three score years and ten, he retired to Florida and a well deserved rest.

He not only achieved success in a material way, but has been of immeasurable service to the science he loved so well. His relatives and friends mourn the loss of one who has been sincere and steadfast in his home, business and social life.

He lived, and may he live, in the hearts and in the lives of those who loved him.

" Farewell! A little time, and we,
  Who knew thee well, and loved thee here,
One after one shall follow thee,
  As pilgrims through the gate of fear
Which opens on eternity.

Yet shall we cherish none the less
All that's left in our hearts meanwhile:
The memory of thy faithfulness
Shall round our weary pathway smile,
Like moonlight, when the sun has set—
A sweet and tender radiance yet."

DISTRIBUTION OF EPILACHNA CORRUPTA MULS.

By F. H. Chittenden, Washington, D. C.

At the present time the collector of Coleoptera can find this cocinellid almost anywhere in the States of New Mexico, Colorado, Arizona, Alabama, Georgia, Tennessee, and Kentucky. In a year or two, at its present rate of travel northward, it will have invaded West Virginia, southern Ohio, and Indiana, possibly Illinois and Mississippi. It has already encroached slightly upon the western counties of North and South Carolina and Virginia and occurs in a few localities in Texas and Utah. It is easy to see how in from three to five years it will have invaded more of the northeastern States and will probably be found in Oklahoma, Kansas, Nebraska, and perhaps Wyoming and Nevada. Its occurrence has been reported in Kansas and Oregon, but these reports can not be verified.

The species was first recognized as a pest in New Mexico about 1850 and was probably present a few years before that, so that it may be safely said to have been present in the United States for 75 years (not 50, as so many entomologists are constantly writing).[1] It is by no means impossible that the introduction of this pest might have resulted from the Mexican War of 1846–48, just as the present invasion of the Mexican bean beetle in the Southeastern States has been attributed to the introduction of the beetle from Colorado in alfalfa hay. This species is not only increasing its distribution, but its food plants, and the beetle has adopted other vegetation in the absence of legumes, and has shown its capacity to breed upon other legumes than edible beans, such as soy bean, cowpea, and beggarweed. In Mexico it has been discovered by Mr. E. G. Smyth on a wild species of bean.

---

[1] See Bul. 843, U. S. Dept. Agric., p. 10, 2d paragraph.

STUDIES ON THE BLOOD OF INSECTS.

By Richard A. Muttkowski, Moscow, Idaho.

II. The Structural Elements of the Blood.*

1. Materials and Methods.
2. Classification of the Corpuscles.
3. Structure of the Corpuscles.
4. Other Structures found in the Blood.
5. Summary of Structures.
6. Bibliography.

1. Materials and Methods.

In the study of the blood of insects several important factors must be considered. One is that the blood courses in a haemocoel and is in direct contact with the various tissues, which pour their products such as secretions, wastes, and histolytic remnants, into the blood. Histolysis and histogenesis are constantly going on during the larval and pupal period and one may find embryonic cells and degenerating tissues in the blood stream. Indeed, the corpuscles themselves are much like embryonic cells and are able to take up various functions as the need arises.

As a result, conditions as found in the larvae are generally somewhat confusing and it is advisable to check up the corpuscles of the larvae, if possible, with those of the adults. For my personal studies, I have held to the criterion that the blood of long-lived adults should give the best information as to what the real corpuscular elements consist of; especially, if these adults were studied a month or more following the final ecdysis, or after hibernation, when all foreign elements are removed and only the true corpuscles remain. If the corpuscles of such adults are examined first, recognition of the larval cells is greatly facilitated.

The manner of drawing insect blood is also of importance. For larvae and pupae a puncture into the abdomen with a sharp triangular needle results in good-sized drops; few tissue elements, such as adipose cells, oenocytes, and muscle fibers, are ever found in such drops. For adults a cut across the base of one of the wings opens the alar channels and yields copious and "uncontaminated" material. These procedures are more satisfactory than slitting the abdominal walls; by the latter means too many tissue elements are loosened and mingled with the corpuscles.

---

* Contribution from the Zoological Laboratory, University of Idaho, Moscow, Idaho.

As regards methods, I have found smear preparations very unsatisfactory. Insect blood does not lend itself favorably for smears; its viscosity causes clumping and undue distortion of the corpuscles, while the gelatin interferes with precise staining. However, I have obtained excellent smears by the following method: A drop of blood is spread somewhat on a slide and placed at once in a moist chamber with excess of moisture. The blood may also be thinned by adding a drop or two of 1 per cent. salt solution. After fifteen minutes to half an hour the drop is decanted, leaving the corpuscles as a white residue. If there is a gelatin coagulum, careful washing will remove it. Flood with a fixative, or immerse in it, and follow by the usual procedures. Such slides show the corpuscles relaxed and in the midst of their activities. Smears can also be stained without use of a fixative, as the stain takes the place of the latter, and taken through the alcohols to balsam or gum-dammar for permanent mounts.

For the study of the functions bulk fixation followed by sectioning, but particularly *in vitro* studies and *direct* staining methods were found of advantage. *In vitro* studies can be made with sealed drops, that is, where the cover-slips have been margined with vaseline to prevent evaporation. With careful manipulation of lights, the movements of the corpuscles can be readily observed. The nuclei, larger pseudopodia, and cytoplasmic bodies, and sometimes fibrin threads, can be recognized without difficulty. The hind wings of Coleoptera, Hemiptera, Orthoptera, and smaller Lepidoptera can be similarly employed. For finer details, however, staining is necessary.

Previous to staining a certain technique is advisable to induce full activity on the part of the corpuscles. Slides with covered drops are placed in moist chambers for fifteen minutes to half an hour to permit "relaxation." A drop of stain is then placed at the edge of the cover-slip and allowed to filter in. The stain acts as a mild fixative and does not cause any distortion. It penetrates only a portion of the drop and becomes diluted as it diffuses inward. This is a distinct advantage, since the intensity of the stain is thus graduated toward the center of the slide.

For *direct staining* over forty stains were tried; but methylene blue, methyl green, Pianese methylene blue-eosin, methyl violet, and picrohematoxylin yielded the best result. Methylene blue was used 0.5 per cent. in 1 per cent. salt solution; it is good for nuclear and cytoplasmic details, but does not show the finer pseudopodia very well, and fibrin not at all. Acidulated methyl green in a 1.0 per cent. aqueous solution reacts similarly to methylene blue, but is inferior to it. Methyl violet, in a 0.1 per cent. solution—stronger solutions stain too deeply—penetrates with great rapidity, bringing out the nuclei, pseudopodia, fibrin, fat bubbles, and various other bodies with considerable sharpness. It is good for general purposes, but not for the finer details. Furthermore, the stain may cause a copious protein precipitate which tends to obscure the corpuscles. It is best used as a check on other stains.

Pianese's methylene blue-eosin is methylene blue saturated in a saturated borax solution, which is later diluted to one-half with saturated borax, to which one-fifth proportion of eosin 0.5 per cent. in 70 per cent. alcohol is added. For my purposes I found a one-fifth to one-tenth proportion of the saturated methylene blue better, adding a few c.c. of eosin saturated in 95 per cent. alcohol. This stain was found the most satisfactory of all. It stains very rapidly, and shows the cytoplasmic and nuclear details with great sharpness, stains the pseudopodia well, the cytoplasmic bodies differentially, and fibrin faintly. Conklin's picro-hematoxylin is diluted Delafield's hematoxylin with a few drops of picro-sulphuric fixative added. It is slow in action, requiring an hour or longer; it is particularly good for the details of the cells, but best for the finer pseudopodia. It does not stain the leucocytes differentially and in time causes a precipitate. On the other hand, it stains the fibrin and small fragments of the blood.

On the whole, the hematoxylin and carmine stains when used directly are of little value for diagnostic purposes, while the aniline dyes serve excellently because of their differential staining. The foregoing stains were found effective in studying the corpuscles of *Aeshna, Libellula, Enallagma,* among Odonata; *Dytiscus, Hydrophilus, Leptinotarsa, Prionus,* and other Coleoptera; *Pieris rapae* and other Lepidoptera; *Dissosteira, Melanoplus* and various other Locustidae; *Belostoma, Notonecta* among Hemiptera; *Leptocerus* and *Phryganea* among Trichoptera; *Stratiomyia, Odontomyia,* Muscoid larvae, etc., among Diptera; and various sawflies and bees among Hymenoptera. In addition, specimens of various species were fixed, sectioned and stained as controls.

As far as the corpuscles are concerned, the sections do not show as fine materials as can be obtained by direct staining methods.

2. Classification of the Corpuscles.

Graber, Cuénot, Berlese, and others have attempted to classify the corpuscles variously according to structure, function, origin, and staining reaction, or a combination of these. Unfortunately, the classifications are mostly based on what is found in a single genus or family and less on comparative studies.

Berlese's classification, based primarily on Muscidae, is as follows: (1) true amebocytes, of embryonic origin, which serve to carry the plastic elements to the tissues; (2) splanchnocytes, smaller in size, with cytoplasm more homogeneous and more deeply stained, which pierce the intestinal coat to replace the intestinal epithelium after its destruction; (3) myocytes and sarcocytes, derived from the destruction of the larval muscles and recognized by their elongated nucleus, their homogeneous protoplasm and strong staining reaction to hemalum; (4) steatocytes, found in the Muscidae, cells which detach themselevs from the adipose tissue of the imagines, to destroy larval residues.

Cuénot's classification, based on Orthoptera, differs materially. He recognizes four types: (1) Amebocytes of small size, with large nucleus and compact cytoplasm, reproducing by mitosis (= myocytes of Voinov, and Berlese's No. 2). (2) Amebocytes of larger size, with abundant protoplasm surrounding a relatively small nucleus; these are the adult corpuscles; when they multiply, which happens rarely, it is by direct division, and one can find after this division masses of protoplasm containing several nuclei (Berlese, No. 1). (3) Other elements which have undergone a beginning of degeneration and contain in their protoplasm acidophil granules. (4) Cells in which degeneration is more advanced; here the protoplasm colors strongly and contains numerous debris of chromatin coming from a chromatolysis of the nucleus (sarcocytes of Berlese, No. 3).

Even from these two summaries it is evident that investigators differ in the interpretation of the various elements. Personally, I find two types of leucocytes prominent in adults and recognizable in the various species by both their size and staining reaction with aniline dyes: (A) Small or rounded corpuscles, somewhat spherical in repose, with a marked cytoplasmic affinity for aniline dyes; (B) larger corpuscles, resembling Amebae, flat or spindular in repose, which react faintly with the same dyes. The latter are the so-called amebocytes. Type A is more embryonic in nature, and gives rise to a multitude of varieties with various functions. As a matter of fact, the amebocytes (type B) are derived from the smaller bodies, for one can find the transitions in size, shape, and staining reactions.

In the following classification the amebocytes are treated as separate entities, as a matter of convenience, since they are prominent in the blood, easily recognized, and about as abundant as the smaller leucocytes. I have reserved the name amebocytes for them. For the smaller bodies I propose the group name "chromophil leucocytes," because of their affinity for aniline dyes. There are other names which might have precedence, such as myocytes and splanchnocytes; but both of these terms apply to specific varieties with definite functions, and are therefore not sufficiently inclusive. Moreover, the term "myocyte" has been used rather promiscuously, so that it is misleading.

Classification of the Blood Corpuscles or Leucocytes. (Based on structure, function, and staining reaction).

1. Amebocytes—originate from the chromophil leucocytes; vary in size from one to four times the diameter of the chrom. leuc.; when floating they are hat-shaped or spindular, when active they are distinctly flat and highly ameboid, with many pseudopodia, some of them extremely long; nucleus relatively small, varied in shape; cytoplasm three to six times the diameter of the nucleus. Appear to divide amitotically. They stain very faintly with aniline dyes. Intermediates between chromophils are frequent. These are No. 2 of Cuénot, No. 1 of Berlese.
2. Chromophil leucocytes—embryonic in origin, and more or less embryonic in nature. Cytoplasm with marked affinity for aniline dyes. Somewhat rounded in shape both in repose and when active, and slightly flattened; pseudopodia many or few, always short; nucleus large, cytoplasm one-fourth to one-half its diameter. Divide mitotically. These are the myocytes of Voinov and others, Berlese, No. 2, Cuénot, No. 1. Various types can be recognized according to activity.
    - a. Secreting chromophils—may be recognized by presence of cytoplasmic bodies, which tend to form a "terminal mass" at one end of the cell. The mass is secreted into the blood, and probably comprises histolytic and other enzymes. Form about one-third to one-half of the chromophils.

b. Transporting chromophils—generally with numerous small fat bubbles externally, especially during feeding periods. Frequently stained with plasmal pigments. Form about one-third of the corpuscles.

c. Phagocytic chromophils—corpuscles with engulfed or adsorbed tissue fragments.

  aa. Small phagocytes, which appear like ordinary chromophils, but are studded with small fragments, which may stain deeply. More conspicuous in adults than in larvae.

  bb. Granule spheres (Körnchenkugeln of Weismann). Recognizable by their increased size, up to five times the diameter of the amebocytes, "tomato"-like shape, and intensified staining reaction. Cytoplasm with numerous tissue fragments, which do not stain with direct stains; hence the cells appear vacuolated. Abundant in larvae, and in adults after ecdysis. These are enlarged phagocytes, and intermediates can be found readily.

d. Splanchnocytes (Berlese, No. 2)—cells which penetrate the intestinal coat to replace the intestinal epithelium. Not distinct from other chromophils, except that they are smallest in size, without external or internal bodies, and stain more intensely than most chromophils. Best recognized in sectioned material.

e. Degenerating leucocytes—generally of slightly larger size, with reduced or absent perinuclear space and acidophil granules. Cytoplasm stains unevenly. More evident in adults after ecdysis (No. 3 of Cuénot).

The myocytes of Berlese (No. 3) are strictly embryonic cells, with considerable resemblance to amebocytes. The nucleus is generally elongate, but may be round. Rare in the blood. In sections they are recognized by their different staining reaction—generally more intense.

The sarcocytes of Berlese are degenerating cells of muscular origin and not true corpuscles (see part 4 of this paper). Cuénot's No. 4 are of this type. The steatocytes of Berlese (No. 4) I cannot place. Cells resembling them are found in adults, but these are phagocytes. Moreover, Berlese's findings on the corpuscles have been much questioned and his results need further investigation.

The foregoing classification is based on studies in which the usual sequence, as noted above, was reversed, proceeding from adults to the pupae and larvae. Thus the work became largely comparative, both as to stages and species. On the whole, I have found more homologies than I could expect among the representatives of the various orders. While the average size of the corpuscles varies both within and between species, perhaps as much as in Vertebrates, the general types are readily recognizable. Their embryonic nature, however, is very marked and it is doubtful if they should really be considered homologous with the leucocytes of higher forms. The plasticity of the chromophils is especially pronounced, as indicated by the studies of various investigators, and confirmed by my personal results.

3. Structure of the Corpuscles.

A. *Amebocytes.*

The amebocytes vary considerably in size both within an individual and in different species (Graber). They vary from cells as small as the chromophil leucocytes to as much as three times their diameter. Their outline is exceedingly variable (Figs. 1–4), and when active they remind one of various Amebae. When contracted or floating they are hat-shaped or spindle-shaped (Figs. 5–6), and their flat structure becomes apparent. The nucleus is generally oval, but frequently highly irregular, with indentations and protuberances (Figs. 2, 4). The nuclear contents are linin threads and chromatin granules, or chromosomes. A nucleolus is present, but not always evident; it is generally elongate in outline, less frequently rounded (Figs. 1, 2, 4).

The nucleus is surrounded by a clear perinuclear space (Fig. 1, ps), which is about one-fifth the diameter of the nucleus. Fine cytoplasmic threads penetrate this space to connect the nucleus with the cytoplasm. In dead or degenerating amebocytes this space is obliterated.

The cytoplasm consists of a thin external film of ectoplasm and a granular endoplasm. Berlese, Henneguy, and others call this cytoplasm homogeneous; on the contrary, I find it very granular (Fig. 1), with larger and smaller granules grouped irregularly, so that cells often appear "mottled." Occasionally, round or oval cytoplasmic bodies are present. Small vacuoles are abundant, and generally a few small fat bubbles. The latter can be recognized by their definite outline, and their homogeneous appearance. Since in some cells they stain deeply, in others not at all, it is evident that different series of fats are present.

The pseudopodia on the whole are rather fine. With Pianese's stain they show definitely. With most stains they appear to be made up of ectoplasm only, but picro-hematoxylin shows fine strands of endoplasm extending to the very tips. The pseudopodia vary in number; I have counted as many as sixty extending from the margins of an amebocyte and could not count those above and below. Figure 4 shows lappet-like pseudopodia, from the end of which extend finer fibrillae. These are quite common. The pseudopodia are thrust forth more abundantly in drops exposed to light than when kept in darkened chambers. In length they vary greatly; during coagulation of the blood pseudopodia of enormous length are extended, and I have observed cells with the lappets measuring as much as thirty times the length of the cell.

The amebocytes are highly thigmotactic. In transparent larvae, as *Enallagma, Chironomids, Dytiscus, Acilius,* and others, and in the hind wings of many adults they may be observed on the walls of the haemocoel and the wing channels, respectively. In open drops they attach themselves to the slide, to the surface film, and to clumps of chromophils and spread out their pseudopodia. In clotting they form a pseudopodial mesh-work, which is then contracted, helping to draw the lips of the wound together.

B. *Chromophil Leucocytes.*

With aniline dyes these leucocytes stain deeply, less markedly with hematoxylins and carmines. It is easy to overstain them because of the great affinity of the cytoplasm for dyes. Thus, with a very weak solution of methylene blue, 0.1 per cent. or even 0.01 per cent., they stain a deep blue, while the amebocytes stain faintly or not at all. The chromophils are rounded in outline, and somewhat spherical in shape, but distinctly flattened (Figs. 7, 10). The nuclear contents are similar to the amebocytes, and the clear perinuclear space is equally marked. The endoplasm is granular, the ectoplasm thinner and barely discernible. Since intermediates in size and staining reaction between the amebocytes and chromophils are not at all uncommon, it is evident that the latter give rise to the amebocytes, these being a specialized type. The varieties of chromophils are many; it is probable that intensive study will show even more types than listed in this paper.

a. Secretory chromophils.—These can be recognized by the tendency to form a "terminal mass" at one end of the cell (Figs. 7, 10). They are quite abundant, forming about a third to one-half of the total number of chromophils. Their pseudopodia are generally few in number and quite short.

b. Transporting chromophils.—The transporting leucocytes are studded with tiny fat bubbles and are frequently yellowish in color. They extrude great numbers of pseudopodia (Fig. 8), and often lappet-like pseudopodia (Fig. 9) recalling those of the amebocytes.

c. Phagocytic chromophils.—If a fixed slide is stained with a differential histologic stain such as Mallory's fuchsin-aniline blue-orange G., the phagocytes stand out with fair clearness. With the stain mentioned, the small phagocytes stain blue and show reddish particles in their cytoplasm or exteriorly, while the large phagocytes contain larger red fragments. These red particles and fragments are chiefly muscle fragments, products of histolysis.

In their number of pseudopodia the small phagocytes resemble the transporting chromophils. With them they form strings and clusters during the agglutination which accompanies the formation of a clot. With direct stains they show cytoplasmic inclusions heaped against the nucleus, usually on one side, and fragments on the exterior of the cell. In adults they can be recognized with little difficulty.

The large phagocytes, or granule spheres, are recognizable by their huge size, much larger than any amebocyte, their spherically flattened shape (tomato-like), and their intensified reaction with direct stains. They are greatly distended by their contents of muscle fragments. Intermediates between the small phagocytes and the spheres are not uncommon. They very rarely send out short pseudopodia; once gorged, they float passively in the blood streams. They are abundant in larvae, and in adults may be found for several weeks after ecdysis.

d. Splanchnocytes.—These are the smaller chromophils, not distinguishable from others, except that they stain somewhat more intensely. In favorable sections one may find them attached to the intestinal wall or piercing the intestinal coats. I have found them in sections of *Leptinotarsa, Pieris rapae,* and muscoid larvae.

e. Degenerating leucocytes.—With Pianese's stain these react erratically, showing acidophil (red) granules and bodies, frequently a broken or compact nucleus, while the cytoplasm stains in patches,—in spots deeply, in other places faintly. Vacuoles are more frequent and larger, and the perinuclear space is absent.

4. Other Structural Elements Found in the Blood.

a. *Muscle bodies* (Caryolytes, sarcolytes, sarcocytes, and myocytes). Besides the leucocytes various types of structures occur in the blood, particularly in larvae, but also in adults shortly after ecdysis. It is necessary to consider these, for at times they are very confusing to students. Of these, certain bodies connected with the histolysis of muscles are important. Reference has already been made to them in connection with the granules spheres; but a brief consideration of their origin will make their identity clear.

According to Kowalevsky, the granules spheres are concerned with the histolysis of the larval muscles. The latter, he states, are broken up by the leucocytes (Henneguy assumes an autolysis of the muscles, followed by an invasion by the leucocytes), the loosened fragments forming so-called *sarcolytes, i.e.,* broken muscle fibers, which are engulfed by the leucocytes. The latter enlarge and become the *granule spheres.* According to Berlese, the fragments are not digested, but carried through the pupal period; after this the leucocytes plasmolyze and set the fragments free, to serve as nutriment for the organs of the adult. Thus, he holds, the leucocytes are not phagocytic in nature. Henneguy, however, finds that the fragments are digested and that the spheres give rise to the primitive cells of the adipose tissue of the adult. This whole question needs more investigation; compare with what has been said under "phagocytes."

Berlese recognizes two types of granule spheres: (1) the *sarcolytocytes, i.e.,* cells carrying muscle fragments, of leucocytic origin, and (2) the *caryolytes, i.e.,* cells with nuclear fragments, or muscle fragments accompanied by a nucleus. In the caryolytes the nuclear fragments condense to a central mass, which breaks up into smaller compact nuclear bodies, each with its own cytoplasm and membrane. These smaller masses are later set free, and constitute the muscle cellules, or *sarcocytes.* Further, Berlese states, the sarcocytes transform into elongate, spindle-shaped cells, the nucleus grows larger, showing chromatin granules, while the cytoplasm is homogeneous. These are the *myocytes,* or muscle cells, which eventually build the muscles of the adult.

Henneguy questions this somewhat adventurous assumption of a degeneration of the caryolytes into sarcocytes and their transformation into myocytes. He believes, that the sarcocytes are due to a chromatolysis of the caryolytes and are eventually either absorbed by the hemolymph or ingested by the leucocytes. Personally, I believe that both processes take place, for quite generally one finds phagocytes studded with particles of various sizes adsorbed to the surface of the cell and other particles enclosed in the cytoplasm, and similar particles float freely in the blood, as shown very clearly in material stained with fuchsin-aniline blue-orange G. Such studded corpuscles are shown in the illustrations of Graber and Kolbe (see Packard). The particles also form the beads on fibrin threads.

The myocytes Henneguy considers present as embryonic cells which enter into the formation of the imaginal buds, or disks, dividing mitotically during nymphosis. These are joined by others which arise from the nuclei of the larval muscles and divide amitotically.

While the origin of these various bodies is of secondary interest in this study, the summary given will be of aid toward their recognition. On the whole, *caryolytes* are rare in the blood and react weakly with direct stains, if at all. They may be recognized by their two or more tiny nuclear fragments. *Sarcolytes,* or muscle fragments, are abundant, but take no direct stain and show no cellular organization. The *sarcocytes* may be excessively abundant, but are minute in size, with a tiny nuclear fragment. They stain erratically, with direct stains, like other degenerating tissue. They appear to undergo histolysis, and gradually break up. The *myocytes,* if present at all, are elongate or round, without pseudopodia, and resemble the leucocytes.

The non-corpuscular nature of these bodies can be more clearly demonstrated by fixation and staining with differential histological stains, such as Pianese's methylene blue-eosin, Mallory's fuchsin-aniline blue-orange G., and others. I have used the latter after fixation with Zenker's fluid on both sections and " smear " preparations. In these the amebocytes stain blue, the chromophils with blue nuclei and bluish pink cytoplasm, while the sarcolytes, sarcocytes, and caryolytes are all a brilliant red in color. The few myocytes show a bright-red cytoplasm and purplish nuclei. Small and large phacocytes are blue, with the foreign inclusions or adhesions red. Since all the histolized muscular elements show a brilliant red without any blue, while the corpuscles are blue and bluish pink, confusion is obviated. Pianese's stain shows similar marked contrasts, depending somewhat on the type of methylene blue and eosin used; rectified or bacterial methylene blue is preferable, while yellow eosin stains less precisely than bluish eosin.

b. *Fat bubbles.*—Fat bubbles of varying size are frequent in the blood at all times. They are distinguishable by their circular shape, definite outline, " smooth " appearance, yellowish color, and strong refraction of light. Kolbe speaks of a " circular nucleus " for the fat bubbles. In this he was undoubtedly misled by the strong refraction, for careful staining with Sudan III or Scharlach Rot and counterstaining with hematoxylin shows the lack of any cellular elements. Due to the refraction of light, it often appears as if a nucleus were present, but the same may be observed in blood treated with concentrated sulphuric acid. The acid dissolves all the cellular elements, but not the fat. The bubbles float to the surface and, by refraction, still show " a dark, circular nucleus."

c. *Adipose Cells.*—The adipose cells are huge in size, round or elongate oval in outline, filled with numerous fat bubbles, and show blackish in transmitted light. They exceed the largest amebocytes by three to six or more diameters. With direct stains they behave erratically, portions staining diffusely or not at all. Their fat contents also stain unequally. In blood from pupae they are abundant, otherwise rare.

d. *Oenocytes.*—These cells are infrequent in blood obtained from punctures. When found, they are recognizable by their great size, rounded shape, round nucleus, and distinctly homogeneous cytoplasm. They stain deeply with direct stains, the cytoplasm with a " smoothness " lacking in any of the corpuscles. Only the granule spheres approximate them in size, but are not easily confused with them.

e. *Parasites.*—Stages of parasites are quite frequent, but are not easily mistaken for other structures. They comprise bacteria and coelomic Gregarines. Bacteria are more abundant in aquatic species, while the spores and gametic stages of coelomic Gregarines are quite common in both terrestrial and aquatic forms.

In general they are barely visible with high powers, are resistant to weak fixatives and stains, and keep up a peculiar twisting, whirling, or dancing motion, which is partly spontaneous, and partly due to plasmal currents. Adult Gregarina may occur, but are recognized without difficulty by their segments, gray color, and great size.

Parasitic Nemathelminthes will also occur in the haemocoel, but less frequently, chiefly of the genera *Gordius, Mermis,* and *Oxyuris.* *Gordius* and *Mermis* are macroscopic, from half an inch to several inches in length. *Gordius,* especially the younger stages, I have found in the haemocoel of various grasshoppers, larger aquatic Coleoptera, larger Chironomid larvae and pupae, in Trichoptera (*Phryganea, Neuronia,* and *Leptocerus*), and in mayfly nymphs. *Mermis* is pinkish in color, and was observed in the blood of Chironomids and in a mayfly nymph. *Oxyuris* is microscopic in size, and is generally regarded as an intestinal parasite. But since I have observed it in the wing channels of *Leptinotarsa, Dytiscus,* and *Hydrophilus* adults and also in abdominal blood from the same species, it is evident that the parasite either pierces the intestinal wall and enters the haemocoel, or is emptied into it during the intestinal histolysis of the pupal period.

f. *Blood Dust.*—Finally, with highest powers one may perceive in fresh blood exceedingly fine particles which for lack of a better name are here called " blood dust." Their nature I have been unable to determine. Perhaps they are histolytic remnants, perhaps secretions, or, like the hemoconiae or blood dust of Vertebrates, infinitesimal portions of disintegrated corpuscles. Like bacteria and the spores of Gregarina they are whirled about by plasmal currents, and form " dancing bodies."

5. Summary of Structures Found in the Blood.

The various structures which may occur in the blood of insects group themselves into two classes, (1) the leucocytes, and (2) tissue cells or products, and parasites. Recognition is based on structure and direct staining.

I. Leucocytes—all with a perinuclear space.
    1. Amebocytes—flat in form, of variable size, oval nucleus, and numerous short or long pseudopodia. Stain faintly with aniline dyes.

2. Chromophil leucocytes—spherical, but somewhat flattened, relatively uniform in size, few or many short pseudopodia. Stain deeply. Of varieties the granule spheres are noticeable for their huge size and intensified reaction with stains. Other varieties are the secreting, transporting, phagocytic, splanchnic and degenerating leucocytes.

II. Other bodies—all lacking a perinuclear space.

3. Sarcolytes—muscle fragments without nucleus. Do not stain.
4. Sarcocytes—muscle fragments enclosing nuclear fragments. Tiny in size. Do not stain or very faintly.
5. Caryolytes—contain several nuclear fragments. Variable in size. Lack a central nucleus and perinuclear space. Stain faintly.
6. Myocytes—much like chromophils at times, but rare in the blood.
7. Fat bubbles—round, uniform, and yellow. Much varied in size. Refract light and do not stain when in plasma. May stain within cells.
8. Adipose cells—elongate oval or round in outline, size larger than amebocytes. Contain many fat bubbles. Blackish in transmitted light. Stain unevenly.
9. Oenocytes—cells much larger than amebocytes, round, with round nucleus. Stain deeply and "smoothly."
10. Parasitic stages—bacteria, spores and gametes of coelomic Gregarina, occasionally adult Gregarina. Minute in size, and do not stain. Keep up dancing motion. Adult Gregarina very large, segmented, and gray in color. Parasitic Nematodes (*Gordius, Mermis, Oxyuris*) are found more rarely; recognizable by size, shape, and motion.
11. Blood Dust—minute particles found under highest powers.

6. Bibliography.

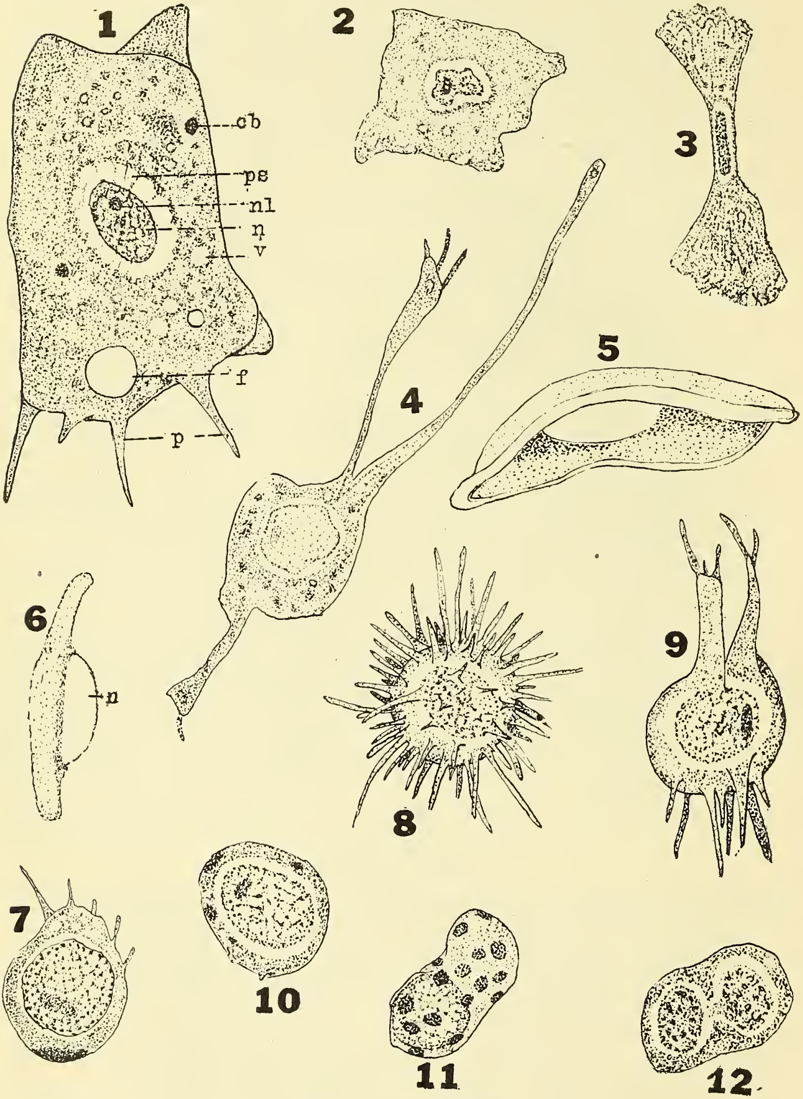
Barratt, I. O. W., and Arnold, G.—A Study of the Blood of Certain Coleoptera: Dytiscus marginalis and Hydrophilus piceus. Quart. Jn. Micr. Sci., 56, p. 149, 1910.

Berlese, A.—Considerazioni sulla fagocitosi negli Insect metabolici. Zool. Anz., 23, 1910.

Cuénot, L.—Les globules sanguines et les organs lymphoides des Invertebres. Arch. Anat. Micr., I, 1897.

Glaser, R. W.—The growth of insect blood cells in vitro. Psyche, 24, p. 1, 1917.

Hollande, A. R. C.—Contribution a l'etude du sang des Coléoptères. Arch. Zool. Exp., 5me ser., 2, p. 271, 1909.


1
cb
ps
nl
n
v
f
p
2
3
4
5
6
n
7
8
9
10
11
12

The Blood of Insects.

Henneguy, I. F.—Les Insectes, pp. 804, 622 figs., 4 pls. Paris, 1904.

Kollman.—Recherches sur les leucocytes et le tissue lymphoide des Invertébres. Ann. Sci. Nat., 9, ser. 8, p. 1, 1908.

Kowalevsky, A.—Études sur le coeur de quelques Orthoptera. Arch. Zool. Exp., 3me ser., 2, p. 485, 1894.

Muttkowski, R. A.—Studies on the Blood of Insects. I. The Composition of the Blood. Bull. Brooklyn. Ent. Soc., XVIII, pp. 127–136.

Packard, A. S.—A Text-book of Entomology, p. 729, figs. 654. New York, Macmillan, 1903.

Tillyard, R. J.—The Biology of Dragonflies, p. 396, figs. 188, 4 pls. Cambridge, 1917.

Voinox, D. N.—Récherches physiologiques sur l'appareil digestif et le tissue adipeux des larves des Odonates. Bull. Soc. Bucharest, 7, pp. 49–50, 473–493, 2 pls., 1898.

EXPLANATION OF FIGURES.

1. Amebocyte, from *Dytiscus* larva. cb—cytoplasmic body, f—fat bubble, n—nucleus, nl—nucleolus, p—pseudopodia, ps—perinuclear speace, v—vacuole.

2, 3, 4. Amebocytes from *Leptinotarsa,* showing various forms. Fig. 4 shows lappet-like pseudopodia.

5, 6. Floating or contracted amebocytes, from *Aeshna* and *Dytiscus.*

7. Secreting chromophil leucocyte, from *Leptinotarsa.* tm—terminal mass.

8, 9. Transporting chromophils, showing pseudopodia. 8, from *Pieris rapae,* 9 from *Leptinotarsa.*

10. Secreting chromophil from *Enallagma.*

11. Degenerating chromophil (acidophil) from adult *Dytiscus.*

12. Dividing chromophil from adult *Hydrophilus.* The nuclei have reformed, but the cytoplasm is not yet divided.

THE NORTH AMERICAN SPECIES OF THE GENUS MEROMACRUS WITH ONE NEW SPECIES.

(Diptera, Syrphidae.)

By James S. Hine, Ohio State University, Columbus, Ohio

This generic name was proposed by Rondani in 1848. Macquart proposed *Plagiocera* some six years earlier but his name is preoccupied in the Coleoptera. Loew's *Pteroptila* proposed in 1865 is a synonym also.

The genus as at present constituted includes sixteen new world species, half of which have been taken in North America, although well toward the South. One species has been taken as far north as Cincinnati, Ohio, but this is considered quite unusual. P. Sack recently has given a good treatment of the genus in Band 43, pages 257–271, Zoologische Jahrbucher, 1920.

Key to North American Species.

1. Legs nearly wholly black or dark brown 2
Legs pale brown or yellowish, coxae and femora often partly or wholly black 3
2. Legs black, robust species .... *cinctus*
Legs dark brown, rather small species .... **obscurus** n. sp.
3. All the femora more or less black 4
Anterior and middle femora not black 5
4. Thorax with a mid-dorsal yellow stripe. All femora marked with yellow and black .... *opulentus*
Thorax without a mid-dorsal yellow stripe. Femora black, middle and posterior ones yellow apically .... *zonatus*
5. Dorsum of the thorax with four yellow spots along the transverse suture .... *decorus*
Dorsum of the thorax with the yellow along the transverse suture interrupted at the mid-dorsum only 6
6. Hind femora in large part black, species mostly composed of large rather robust specimens, sometimes rather small however .... *cruciger*
Hind femora not black, species of medium size 7
7. Abdomen black, at least basally; fuscous marking of anterior border of wing reaching from near base to apex... *pratorum*
Abdomen reddish brown, fuscous marking of anterior margin of wing on apical half only .... *ruficrus*

Meromacrus cinctus Drury.—Known from all other species of the genus by its entirely black legs. It is a large, robust species with black thorax and mostly red abdomen marked by spots and bands of bright yellow hair. Some specimens of each sex have a band of bright yellow hair at the base of the third abdominal segment and some do not. Known from Jamaica, Porto Rico and Santo Domingo. Recent check lists give *pinguis* Fabricius and *ania* Walker as synonyms.

Meromacrus cruciger Wiedemann.—A rather large, somewhat elongate species, body almost entirely black in color with yellow markings, legs rather pale reddish yellow, except the hind femora which are in large part black. Wings largely hyaline, apical half of the anterior margin rather conspicuously fuscous. Widely distributed in southern United States. Known from Ga., Fla., N. Car., Arizona, Miss., Texas, Oklahoma, Kentucky, S. Ohio. Specimens are at hand from Cuba, Vera Cruz, Tobasco and British Honduras. The name *crucigera* used by Williston and *milesformis* Macquart are synonyms. Some consider *acuta* Fabricius as the same in which case this name should have priority.

Meromacrus decorus Loew.—One of the smallest species of its genus. The only one known where the yellow along the transverse suture of the thorax is broken up into four distinct spots, and the same color in front of the scutellum into three spots. The dorsum of the thorax therefore has nine yellow spots. Known only from the island of Cuba.

Meromacrus obscurus n. sp. Male.—Total length of body 11 mm., length of wing 9½ mm., width of head a little over 3 mm. A dark colored species with no conspicuous markings, eyes bare, contiguous for a short distance, vertical triangle longer than wide, ocelli prominent, arranged in a nearly equilateral triangle; frontal triangle largely black in ground color, rather long yellow pilose and very thinly gray pollinose, more conspicuously so near the eyes; face of nearly equal width from antennae to oral margin, shining black on middle from oral margin half way to antennae, sides yellowish gray pollinose and yellow pilose. Antenna rather short, brown in color, third segment oval, dark on apical half, pale basally, arista pale yellowish. Thorax black in ground color, before the scutellum with a transverse band of yellow pile, widest at mid-dorsum where it sends forward a very narrow line of yellow pile to anterior thoracic margin; on each side of the thorax a line of yellow pile follows the transverse suture from outer margin to two-thirds the distance to mid-dorsal line where it unites at an acute angle with a similar line which passes forward parallel to the mid-dorsal line to anterior thoracic margin; each humerus gray pollinose; scutellum brown with short sparse pile of the same color; wide anterior margin of the wing brownish-fuscous which color is less pronounced toward base of wing, and much of the costal cell is nearly hyaline; legs mostly rather dark brown, each hind femora especially has a rather well defined patch of pale brown on each side on apical third including the entire apex but only the inferior part of the femur further basad; a conspicuous patch of silvery hair outwardly on each hind coxa. The exact coloration of the legs is difficult to describe, for suggestions of paler color are apparent in irregular areas at various places here and there, thus breaking up the dark brown which predominates. Abdomen dorsally dark brown and in most part sparsely pale yellow pilose, first segment gray pilose laterally and narrowly on posterior margin, third and fourth segments with a narrow basal pale yellow band of nearly uniform width throughout. Hypopygium just slightly lighter brown than the preceding segments. Holotype male collected by myself at Los Amates, Guatemala, between January 16 and 20, 1905. This species and *opulentus* are the only North American species of the genus having a mid-dorsal thoracic stripe. The two are easily separated however by the color of the legs and by size.

Meromacrus opulentus Bigot.—Known only from Cuba. The thorax has a narrow lead-colored mid-dorsal stripe. Legs reddish-yellow, anterior femora with a broad irregular black ring, middle femora black beneath, posterior femora broadly blackish basally. This insect has some affinities with *obscurus* but the legs are very differently colored and the size is larger.

Meromacrus pratorum Fabricius.—A dark nearly black species near cruciger, but of smaller average size and with uniform pale brown femora throughout. The yellow thoracic markings are narrower than in the other North American species of the genus except *obscurus*. Known from Porto Rico, St. Vincent and from several places in South America.

Meromacrus ruficrus Wiedemann.—Male: Abdomen and legs reddish brown in general coloration. First abdominal segment largely black with a prominent yellow pilose transverse marking. A divided yellow band at the base of the third segment. Narrow posterior margins of abdominal segments two, three and four dorsally yellow. Usual anterior margins of the wing darker in color, fuscous on apical half. Known from Cuba and Florida.

Meromacrus zonatus Loew.—Thorax black with white markings. The front femora are all black, middle femora black at base, posterior femora black on basal two-thirds. Williston gives a translation of Loew's original description on page 182 of his Synopsis and adds to it on page 87 of Volume III, Diptera, Biologia Centrali Americana. Known from Guerrero, Mexico, and from other Mexican localities.

A NEW SPECIES OF THE GENUS BRACHYCISTUS FOX (Hymenoptera, Aculeata).

By J. R. Malloch, Washington, D. C.

The species described herein is referable to the subgenus *Brachycistellus* Baker, this being the fourth known from this country, all of which occur in the southwestern States.

The type specimen is deposited in the collection of the United States National Museum. Paratypes are in the collection of the U. S. Biological Survey.

Brachycistus (Brachycistellus) inermis sp. n.

Male.—Pitchy black, usually paler on sutures of thorax and apices of abdominal segments; antennae, mandibles, clypeus, palpi, and legs testaceous yellow. Stigma pale.

Structurally similar to *paupercula* Bradley, but the clypeus has no central tubercle, being transversely concave in middle, with the lower margin curved outward. The head is otherwise similar to that of *paupercula,* the ocelli being large and the distance between the hind pair a little greater than the space between either of these and the margin of eye. Venation as in *paupercula.* Length, 3.5–4 mm.

Type and five paratypes, Higley, Arizona, June 15–18, 1917 (E. G. Holt).

A NEW OIKETICUS FROM TEXAS (Lepid., Psychidae).

By Wm. Barnes and F. H. Benjamin, Decatur, Ill.

Oiketicus bonniwelli sp. nov.

♂. Head, thorax, abdomen and ground color of wings luteous-brown. Primaries: with a dash-like black suffusion on base of vein 1; a slight black suffusion along the base of the radial-medial veins; cell filled by a black suffusion, which extends into the s. t. area, and into the terminal area at anal angle; discocellulars conspicuously marked by a white patch which is distally produced to points on the veins, fringe practically concolorous. Secondaries: concolorous. *Expanse:* 42 mm.

Similar in wing shape to *townsendi* Ckll., but much darker in color. Differs from *abbotii* by being larger, lighter in color, and possessing more rounded secondaries. At first the authors were inclined to consider this the true *abbotii,* the type of which (from Texas) is in the Graef Collection. Mr. Doll, however, has compared specimens of both species with the type and has marked a specimen of the common Florida species, "agrees with type."

♀. Grub-like, white, hair surrounding the anal segments rich luteous-brown.

Pupae: ♂ similar to, but considerably larger than *abbotii;* ♀ similar to ♀ *abbotii.* Length: ♂ 26 mm.; ♀ 33 mm.

Bags: radically different from those of *abbotii*; longer, similar to those of *townsendi,* thatched with leaves and long sticks, the sticks laid lengthwise along the case; no transverse sticks.

Larva: head whitish heavily marked with brownish-black; the black bounding the vertex of the epicranium; extending ventrally between the lobes; four stripes extending diagonally from near the clypeus and the suture between the epicranial lobes, caudally; almost fused dorsally of the center of each epicranial lobe; with an additional small spot practically connecting these with another black marking which borders the clypeus; ventral half of each lobe of the epicranium bounded caudo-ventrally with black and caudally with an additional three black diagonal lines; cephalically with a number of black dots and splotches; anteclypeus bounded dorsally by black and brown; labrum blackish-brown; mandibles black; antennal distal joints brown, basal joint white distally tinged with brown. Thorax: white, longitudinally striped with broad mottled brownish-black bands; cervical sclerite large, with a lateral and dorsolateral band on each side; meso- and metathorax with similar bands. True legs: mainly blackish, with some white blotches, and tipped with reddish-brown; bounded dorsally by a white line. Abdominal segments: of a dirty neutral tint, darkest dorsally, lightest laterally; spiracles brownish-red surrounded by darker reddish-brown; above them, on each side of the first four abdominal segments is a whitish spot, strongest on the first segment. obsolescent on the fourth; some additional faint, small, blackish spots present, especially latero-ventrally and ventrally; three somewhat distinct whitish blotches latero-ventrally on each side of the first and second abdominal segments. A whitish blotch above the proleg on the fourth abdominal segment. Prolegs: whitish, their hooks reddish. Length of larva: about 30 mm. Diameter: first thoracic segment, 3¾ mm.; second abdominal segment (largest), 5 mm. Head: about 2½ x 2½ mm.

Type locality: El Paso, Texas. *Number and sexes of types:* Holotype ♂, April 1920; Allotype ♀ and bag, May 1923; Paratypes as follows: 10 ♂, April 1920; 4 ♂, 1 ♀, 3 ♀ in pupal skins and bags, 2 ♂ pupae and bags, 1 ♀ pupa and bag, 1 ♂ pupa with fungus growth and bag, 4 ♂ pupal skins and bags, 1 ♀ pupal skin and bag, 1 inflated larva and bag, May 1923.

Notes: Bred by Mr. J. G. Bonniwell, in whose honor the authors take pleasure in naming the species.

Note on Anamorphus.—Since finding this rare beetle at Cincinnati, Ohio, vii, 9, 01, two others have been taken and another one, which escaped, was seen. They vary in color and punctuation and on a study of these better specimens I find the claws are toothed, a character not mentioned in any literature. The pair taken, v, 22, 22, were swept from vegetation. Their great resemblance to the common *Rymbus minor* may cause them to be overlooked by collectors, but the strong thoracic lobe and curved lines of *Anamorphus* will readily separate them. Le Conte in Coleoptera of Florida (p. 445) says, "without prothoracic lines," he evidently having failed to see them.—CHARLES DURY, Cincinnati, Ohio.

BOOK NOTES.

Report on Certain Arthropods and Polychaetous Annelids of the Barbados-Antigua Expedition of 1918. (University of Iowa Studies in Natural History, vol. X, no. 3, pp. 1–57, with 11 plates, nos. I, I–II, and I–VII.)

This report is by several authors—the Ants by Dr. W. M. Wheeler, Spiders by Elizabeth B. Bryant, land bugs by H. G. Barber, water bugs by J. R. de la Torre-Bueno, and Polychaetous Annelids by Catherine A. Mullin. Dr. Wheeler describes three varieties and one subspecies, namely: *Camponotus sexguttatus* var. *antiguensis,* var. *montserratensis* and var. *unitaeniatus;* and subsp. *basirectus.* In the spiders, Miss Bryant describes six as new—*Prionolaena gracilis, Pseudosparianthus antiguensis, Sossipus insularis, Oxyopeidon maculipes, Cyrene graciosa* and *Sidusa stoneri.* Mr. Barber, dealing only with the families Coreidae, Pyrrhocoridae, Lygaeidae, Reduviidae and Tingidae describes one species as new—*Doldina antiguensis.* Out of ten species of aquatic Hemiptera, Bueno describes two as new: *Arctocorisa antiguensis* and *Belostoma impavidum.*

The *Report on Some Polychaetous Annelids* by Miss Mullins is somewhat different in form from the others, which are more of the nature of annotated faunal lists. Miss Mullins begins by a discussion of the annelids as a whole; and then gives a brief description of each species from the region. The paper includes a bibliography and seven plates.

In general, the forms listed in this report are species distributed throughout the West Indies or tropical America; or else of universal distribution. In the ants *Monomorium* (*Xeromyrmex*) *salomonis* subsp. *subopacum* appears to be introduced from Africa; *Camponotus sexguttatus* var. *unitaeniatus* is South American only; subsp. *basirectus* from Peru. The new species of spiders are of course new records. All the bugs, except the new species Mr. Barber describes, are also well-known West Indian or tropical American forms. The water bugs, in addition to the two new species, register *Buenoa albida* Champ. as heretofore not reported from the West Indies. None of these forms have been before reported from Antigua or Barbados. The annelids show a Pacific Ocean species, *Eurythoe pacifica,* from Barbados; the others being West Indian or Floridian.

On the whole, this report is very useful, as it confirms or extends the distribution of a number of species in addition to the new forms recorded.

J. R. T. B.

SPECIAL NOTICE TO AUTHORS.

Charges for Extra Reprints.

As announced in our issue of December, 1923, a higher cost of printing separates compels us to make a radical upward change in our charge for reprints above the 25 gratis to authors.

Twenty-five additional will be furnished at our old rate (See BULLETIN for February, 1923). Special reprints will not be furnished in less than 100 copies (including the 25 free reprints). The charge for these will be: not over 100 copies, 4 pages or less, 7 cents per copy; 5–8 pp., 9 cents; 9–12 pp., 11 cents; 13–16 pp., 13 cents. Over 100 copies, 4 pages or less, 5 cents; 5–8 pp., 6 cents; 9–12 pp., 7 cents; 13–16 pp., 8 cents. Of course, we will make these charges as reasonable as possible on longer papers or for larger numbers of copies. The prices for special covers remain the same until further notice.

No one regrets this advance more than we do, but when the cost of journals far exceeds what they bring in for subscriptions and from other sources, conditions force drastic economy. We must, in common with every journal, meet increased costs in some manner if we are to continue. In fact, it is quite demonstrable that subscribers pay far less than the actual cost to print the publications, as our books show.

THE PUBLICATION COMMITTEE,
of the Brooklyn Entomological Society.

Agrilus viridis in Massachusetts.—A specimen of the European *Agrilus viridis fagi* Ratz. (determination by Charles Kerremans from a New Jersey specimen many years ago) was taken June 17, 1923, in Southborough, Mass., by sweeping grass. This species was first reported in this country in 1914 by Mr. H. B. Weiss, of New Brunswick, as attacking the stems of *Rosa rugosa.* —C. A. FROST, Framingham, Mass.

One of the most beautiful red gold butterflies of the world—

Chry. virgaureae—for only 6 cents each, as long as the stock lasts. Other small species for decorative purposes at 2 cents to 5 cents each; and also exotic Lepidoptera.

Our New List of Books, Pins, Apparatus and Supplies free.

Our Price List No. 58 contains 28,000 species of Lepidoptera, the greatest and most extensive of all lists........ $1.00

Price List No. 30 contains 30,000 species of Coleoptera........ .50

Price List No. VII, 10,000 species of other insects........ .50

Price of the catalogue will be allowed for in billing orders for Insects.

Kindly send price in dollar bills; or in postage stamps.

DR. O. STAUDINGER & A. BANG-HAAS
BLASEWITZ, DRESDEN, GERMANY

An Introduction to Entomology

By JOHN HENRY COMSTOCK, Professor of Entomology and General Invertebrate Zoology, Emeritus in Cornell University.

PART I—The Structure and Metamorphosis of Insects

This volume is the first part of a text-book of entomology that Professor Comstock has in preparation. It is, however, a complete treatise on the structure and metamorphosis of insects. The part now published includes four chapters. The first chapter is entitled "The Characteristics of Insects and Their Near Relatives." In this chapter the characteristics of the Arthropoda and of each of the thirteen classes of arthropods is discussed, with figures of representatives of each of these classes. The second chapter is devoted to a detailed discussion of the external anatomy of insects. The third chapter treats of the internal anatomy of insects and includes the results of recent investigations in this field. In the fourth chapter there is a detailed account of the transformation of insects, in which each of the different types of metamorphosis of insects is discussed. There is also included a bibliography and an index.

Pages, xviii + 220, with 220 illustrations. Bound in cloth. Price, $2.50 net.

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chloripe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By JOHN B. SMITH, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to LIBRARIAN, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XIX APRIL, 1924 No. 2

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

1872

Smithsonian Institution
APR 1 5 1924
National Museum.

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO,
Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published by the Society

Price, 35 cents Subscription, $1.50 per year

Mailed April 12, 1924

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa., under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1924

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
J. BEQUAERT

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
HOWARD NOTMAN

CONTENTS

ON HALOVELIA MARITIMA BERGR., Esaki 29
CHRYSOBOTHRIS VIRDIGRIPENNIS IN CANADA, Frost 34
PARALLELINA SAUCIA, Frost 34
COLORADIA PANDORA, A MENACE TO PINE FORESTS IN EASTERN OREGON, Engelhardt 35
DORYTOMUS FROSTI, Frost 37
RETURN OF LEPTINOTARSA JUNCTA TO THE DISTRICT OF COLUMBIA, Chittenden 37
NEW PAPILIO FROM SAGHALIEN, Nakahara 38
A NEW ENICOCEPHALUS, Bruner 39
ECOLOGICAL OBSERVATIONS ON RHYNCHOPHORA IN SOUTHERN PINES, N. C., Manee 40
NEW LOCALITY FOR COPAEODES MINIMA, Bell 43
LIBYTHEA BACHMANI IN L. I., Bell 43
CALIFORNIA BUTTERFLY NOTES—II, Coolidge 44
HETEROPTERA FROM MASSACHUSETTS, Bueno 48
A NEW NORTH AMERICAN AMIOTA, Malloch 51
A BIRD IN A SPIDER WEB, Bromley 52
EDITORIAL 54

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XIX April, 1924 No. 2

ON THE CURIOUS HALOPHILOUS WATER STRIDER, HALOVELIA MARITIMA BERGROTH (Hemiptera: Gerridae).

By Teiso Esaki, Entomological Laboratory, College of Agriculture, Kiushiu Imperial University, Fukuoka, Japan.

No observation concerning the halophilous water strider, *Halovelia maritima,* has appeared since it was first described by Bergroth in 1893, from Cartier Island, Timor Sea. This insect is found abundantly in a part of the Pacific Coast of Japan and I made some observations on it at the Marine Biological Station of the Tokyo Imperial University at Misaki, Province of Sagami. The following note may be of interest not only from a biological but also from a systematic point of view.

SYSTEMATIC NOTES.

Halovelia maritima was described by Bergroth as a member of the Veliidae. In reality, however, it belongs to the Gerridae. The general aspect and the minute size of this insect are very suggestive of the Veliidae, but morphological characters are undoubtedly those of the Gerridae. The four-jointed rostrum, the unusually long distance between the bases of the anterior and two posterior pairs of legs, and the long posterior femur which extends beyond the end of the abdomen certainly place this insect in the Gerridae and not in the Veliidae.

Bergroth described the rostrum of this species as follows:

" Rostro coxae anticae attingente, articulis duobus primis brevibus, secundo basin capitis non attingente, tertio basalibus duobus unitis longiore, . . ."

His " tertio " or the third joint is, in reality, the third and fourth joints taken together. The surface of the body and appendages of this insect is wholly covered with the velvety minute setae which obscure the external structures. The segmentation of the rostrum is apparently not distinct even under the magnifying-glass, but a careful examination under the microscope well distinguishes them.

I identify the Japanese species with *Halovelia maritima* Bergroth as our specimens quite agree with his description and with the topotypes of *Halovelia maritima* preserved in the Department of Agriculture, Government Research Institute of Formosa. The insect was recorded by Yano and Miyake in Japan as *Metrocoris* sp., but no study has been made. Here I give a description of the species.

Halovelia maritima Bergroth.

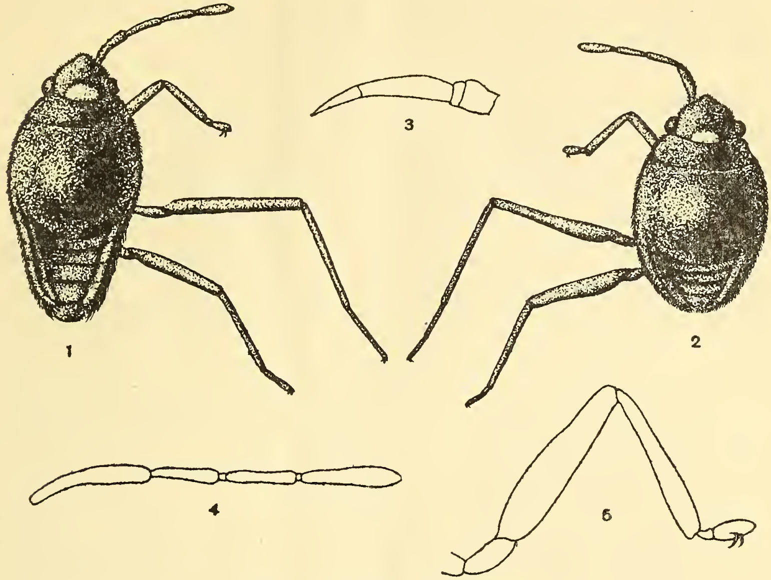
Halovelia maritima Bergroth, Entom. Month. Mag., vol. 29, p. 278, 1893.

Metrocoris sp., Yano, Hakubutsu no Tomo (Naturalists' Companion), Tokyo, vol. 7, p. 289, 1907.

Metrocoris (?) sp., Miyake, Konchugaku Hanron (General Treatise on Entomology), vol. 2, p. 502, fig. 299 B, 1919.

Body fusiform, strongly swollen above, thickly covered with velvety black setae. *Head* black with the central basal area somewhat purplish brown, apex moderately produced anteriorly. *Eyes* brownish black, shining, prominent, inner margin not sinuate. *Antennae* black, first joint longest, thicker than second or third, much thickened in the male, distinctly curved outwardly; second and third subequal in length, about two-thirds of the first, thinner than the last; fourth a little shorter than the first, thicker than second or third, claviform. *Rostrum* reaching the anterior coxae, first joint short, slightly longer than broad; second very short, only one-third the length of first; third longest, slightly swollen at the central portion; fourth a little longer than one-half of the third, strongly tapering into a point.

Pronotum narrow, transverse, anterior margin moderately sinuate, posterior margin nearly straight or rather slightly curved posteriorly. *Meso-* and *metanotum* together globosely swollen. *Prosternum* moderately concave, mesosternum very wide, moderately convex, metasternum much narrower than mesosternum, diminishing laterally in length. *Legs* black, somewhat brownish. *Anterior legs* rather short, coxa and trochanter short, nearly equal in length, femur longest, moderately incrassate, tibia slightly shorter and much thinner than femur, slightly thickened towards the apex, tarsus short,



EXPLANATION OF FIGURES.

1. *Halovelia maritima* Bergroth, female. × 18.
2. *Halovelia maritima* Bergroth, male. × 18.
3. *Halovelia maritima* Bergroth, rostrum, lateral view.
4. *Halovelia maritima* Bergroth, antenna of female.
5. *Halovelia maritima* Bergroth, anterior leg of male.

rather claviform, first joint very short and small, second about three times as long as and much thicker than first, claws inserted near the center of second joint. *Intermediate legs* long and slender, coxa short, trochanter about twice the length of coxa, femur and tibia nearly equal in length, the latter being distinctly thinner than the former, tarsus about two-thirds the length of tibia, first joint much longer than second, claws inserted almost at the apex of the second joint. *Posterior legs* much shorter than intermediate pair; coxa and trochanter short, subequal in length; femur about two-thirds the length of intermediate one, but much thicker than the latter; tibia nearly as long as femur but much thinner; tarsus short, first joint nearly one-half of second, claws inserted almost at the apex. Abdomen very short, rather concave above, connexivum strongly sloped inwardly especially in the female. Ventral surface of abdomen moderately convex. Length of body: male, 1.5 mm., female, 2 mm.

Locality: "CARTIER ISLAND, Timor Sea, about 175 miles (Eng.) from Cape Bougainville and Cape Voltaire on the mainland of N. W. Australia, and about 110 miles (Eng.) from Rotti Island, near Timor" (Bergroth). JAPAN—Misaki, Province of Sagami (Esaki col.). LOOCHOO ISLAND—Naha, Island of Okinawa (Sonan col.). FORMOSA—Tansui, Northern Coast (Esaki col.), Koshun, Southernmost Coast (Sonan col.), Island of Kashoto (Samasana), near the Eastern Coast (Sonan col.).

Habitat.

Bergroth states that "Mr. Walker found several specimens under blocks of coral, below high-water mark."

In the Ent. Mo. Mag., xxvii, p. 235, Mr. Walker writes on the capture of this insect:

"Cartier is a mere sand bank, less than half a mile in length, and destitute of even the smallest trace of vegetation, but it is surrounded by an extensive coral reef, over which I had to walk, through water two feet and a half in depth, for a mile and a half, and pretty hard work, too, I found it. There was, of course, nothing to do on the islet except to look for shells, of which I found a good many, and while looking for these I met with a very curious and interesting Hemipteron (I fancy of the genus *Halobatodes*) inhabiting the sand beneath stones near low-water mark, *à la Aëpus.*

"Judging by the habits of this insect, it has presumably no winged form, as the use of wings to it seems rather problematical. The dense velvety clothing of the body makes it possibly capable of retaining air and breathing for some time, even when submerged at high water. It is probably the only insect of Cartier Island."

In Misaki, these insects are abundantly found on the surface of sea-water among the rocks on the coast from June to September. Some of them climb on the rocks near by. When the waves lip the beach they vanish out of sight, probably climbing upon the rocks or other objects on the coast. They never submerge as supposed by Bergroth. The dense velvety clothing protects the owner from getting wet. They can live for a considerably long time on the surface of water without resting on an object projecting above water. This fact is never seen in common freshwater Gerridae. On summer days, the majority are found in copulo, and no form of the immature stages is found.

In Tansui, Northern Formosa, they are found on the small pools and streams among the rocks near the coast exposed at ebb-tide. They are lightly striding on the surface, but never walk upon it as the members of the Veliidae.

Food.

The bulk of the food of this insect is probably small plankton crustaceans. I observed in the aquarium one female catch a small plankton copepod and another female a small red mite of the genus *Leptotrombidium* which inhabits the surface of the sea. They hold the prey on the tip of the rostrum without touching it with the legs. I also observed some individuals feeding upon a dead amphipod. When I threw a dead house-fly in the aquarium, many of them immediately gathered and fed upon it, and they never use their legs in holding their food.

During mating females sometimes take food, but males never.

Locomotion.

They slide a short distance very rapidly and lightly. This is mainly caused by setting their intermediate pair of legs in motion backwards. They also skilfully walk and climb on the rocks. This motion is not so skilful in the other species of the Gerridae. In this motion, the right and left legs are used alternately. They can easily climb and rest on the perpendicular glass aquarium wall. When they properly utilize the wind on the sea, these small insects can move a distance longer than one foot at one glide. They sometimes jump on the rocks and also, though rarely, on the water.

Cleaning.

They clean their own rostrum with the anterior legs, and the right and left legs clean each other. When they clean the rostrum, the legs of both sides are approached toward each other to keep the body at a higher level above the water. When they clean the intermediate or posterior leg, they incline their bodies to the opposite side of the leg which is to be cleaned.

Copulation.

The males place themselves on the back of the females, holding the abdomen of their mates with the anterior and posterior legs. The intermediate legs are bent and closely laid along the body and the articulation between femur and tibia projecting beyond the apex of the head. The attitude of the females in copulo is not different from their normal one. The locomotion during the copulation is by the females only. The somewhat globular-shaped males are maintained steady upon the concave dorsal surface of the abdomen of the females. If a male is going to copulate, he catches a mate suddenly, holding her by her intermediate or posterior leg, and after fitting his copulatory organs to hers he turns upon the back of the mate. During these motions, both sexes are rolling on the surface of water in all directions.

No datum on the life-history of this species is known though it seems extremely interesting. I did my best to get the eggs and larvae of this insect but unfortunately failed.

Chrysobothris virdigripennis in Canada.—An interesting series of *Chrysobothris virdigripennis* Frost was submitted to me last winter by Mr. N. K. Bigelow, of the Royal Ontario Museum of Zoology. There were 76 specimens including 51 males and 25 females. All but a few, which were taken on balsam fir, were collected on white spruce at Macdiarmid, Ont.; the dates ranging from June 27 to August 14, 1922. This series is composed almost entirely of the dark bronzed variety and only a few of them show any indications of the beautiful green color of the types from Maine. Between June 30 and September 2, 1923, Mr. Bigelow took 9 males and 7 females at the same locality. Two males exhibit the characteristic green color to a marked extent.—C. A. Frost, Framingham, Mass.

Three specimens of *Parallelina saucia* Lec., said to be a variety of *exigua* Newm., were captured during the summer of 1923; one of them at Cornwall, Conn., on a pile of mixed cordwood, June 25, and the other two at Tyringham, Mass., July 14, on the limbs of a large linden tree which had been felled the previous winter.—C. A. Frost, Framingham, Mass.

THE SATURNIID MOTH, COLORADIA PANDORA, A MENACE TO PINE FORESTS AND A SOURCE OF FOOD TO INDIANS IN EASTERN OREGON.*

By George P. Engelhardt, Brooklyn Museum.

On August 1, 1923, while visiting with the entomologists at the Agricultural College, Corvallis, Oregon, a report came in that serious injury had been inflicted upon the pine forests of eastern Oregon by the larvae of the Saturniid moth, *Coloradia pandora.* Mr. W. J. Chamberlain being delegated to the immediate investigation of the infested region, it was my privilege to accompany him on this trip, which involved a 250-mile auto drive with opportunities to see the magnificent forests of the Cascade Mountains and to visit the Marble Caves and Crater Lake. On August 5, upon reaching the Klamath Indian Agency, located in the wide valley above Upper Klamath Lake, we were informed that the infestation was most severe throughout the yellow pine forests extending southward for 40 or 50 miles in the Klamath Indian Reservation. This necessitated a detour from the fine highway to lumber roads winding through a sandy, undulating country with occasional outcroppings of basaltic and other volcanic rocks. Extensive lumber operations had removed all of the millable timber for many miles, leaving only a scattered growth of small pines and on these no indications of caterpillar attacks could be found. On the other hand, an abundant shrubby plant with brilliant yellow flower clusters proved very attractive to insects of various kinds and many interesting captures were made during short stops.

Upon reaching Kirk, a saw-mill settlement 30 miles south of the Klamath Indian Agency, we entered a region of big, tall timber with many pines 4 to 5 feet in diameter, and well above a hundred feet in height. Here lumber jacks were at work. The men evidently were well acquainted with what they called the "pine-tree worms," for they related that during the feeding period in June and early July the constant dropping of excrement made a noise like a sleet storm and that a few weeks previous the tree trunks were literally alive with the worms descending to enter the ground. Pointing out a tall pine at the edge of a clearing we could readily see that the tree had been completely defoliated but for a new growth of short needles at the very tips of the twigs. After that it was easy to recognize the route of the insect invasion. Curiously enough, it appeared to be principally the big trees which had been subjected to attack, not on a broad front but rather along more or less well defined lanes with untouched areas between. The route, we were told, extended throughout the yellow pine belt of eastern Oregon into northern California and that it represented the occurrence of the insect in countless millions about every twenty years, while otherwise it is only fairly common every alternate year.

---

* Abstract of an address before the Brooklyn Entomological Society, January 10, 1924.

Being too late to search for larvae, we began to look for pupae in the ground below the trees and soon discovered that these could be found easily and in untold numbers by simply combing with one's fingers the loose, volcanic ash of which the soil was composed just below the cover of pine needle mould. A scoop of the hand was likely to produce 3 or 4 and in a short time we had an ample supply. About 50 per cent. of the pupae had been killed by parasites and bacterial diseases. A large mortality among the fully-grown larvae also was indicated by the windrows of shrivelled-up specimens around the base of trees. Chipmunks and other small rodents and insectivores also no doubt account for a large amount of the pupae, for their shallow excavations could be observed everywhere under the trees. However, these and other factors will be considered critically in Mr. Chamberlin's investigations on control measures. The writer's part was chiefly that of an interested spectator.

The following information concerning the life cycle of the insect is based on what could be learned from the forest rangers and lumber men at the time and may be subject to correction. The moths are not due to emerge until August or early September of the next year following pupation; the eggs are laid in masses, usually encircling twigs; the young larvae, hatching in September, construct a slight web, one for each colony, from which they issue to feed but return daily and remain in it for hibernation when frost sets in; this communal life is continued in the spring until the larvae are about half-grown, when they scatter and become vagabonds; pupation takes place in late June and during July.

In years of heavy infestation the defoliation of the yellow pine no doubt amounts to a serious drain upon the vitality of the trees which very likely would prove fatal should it be repeated in consecutive years. Fortunately, there are periods sufficiently long for rest and recovery, but it is matter which demands attention on the part of the forest service.

Report, furthermore, reached us that parties of Indians were assembling in parts of the infested regions for the purpose of harvesting the living pupae which is done by women and children armed with hoes and rakes. After gathering the pupae by bushels they are roasted and pulverized and in that shape represent a welcome addition to the menu of Indian food.

A lot of a hundred or more of the living pupae are now wintering, apparently successfully, in an unheated storage room at the Brooklyn Museum. As a matter of record it may be of interest to mention the capture of a newly-hatched female of the same species, found resting by the writer on the trunk of a yellow pine on the Colop Plateau, S. W. Utah, on August 23, 1923.

A single specimen of *Dorytomus frosti* Blatchley was taken in an extremely dry field at Canaan Conn., on June 26, 1923. This specimen is exactly like the unique type which was taken on a tree trunk in Sherborn, Mass., October 5, 1910.—C. A. Frost, Framingham, Mass.

The Return of Leptinotarsa juncta Germ. to the District of Columbia.—September 24, 1923, Miss Marion T. Van Horn furnished the writer with specimens of eggs, larvae and adult of this species collected in the northeastern section of Washington, D. C. On earlier occasions in July, 1922 and 1923, the species was collected in all stages by Miss Van Horn in the vicinity of Hawlin, Va. The occurrence of this species in the District of Columbia is surprising, considering the fact that it had apparently completely disappeared, not having been seen, to the writer's knowledge, for at least thirty years. A reason for this is suggested; that the species was literally driven out and replaced by *Leptinotarsa 10-lineata* Say, which in its earlier occurrence ate and destroyed *Solanum carolinense,* the natural food plant of *juncta.* During recent years *L. 10-lineata* has been comparatively rare, and the wild Solanum has multiplied in great numbers in waste places almost everywhere.—F. H. Chittenden, Washington, D. C.

AN INTERESTING NEW PAPILIO FROM SAGHALIEN.

By Waro Nakahara, New York City.

The new *Papilio* described herein has the shape of hindwing of *P. maackii* Ménétriés and the colorational characters of *P. bianor* Cramer combined. It is one of the two *Papilios* known up to date from the island of Saghalien, the other species being *P. machaon septentrionalis* Verity (Syn.: *P. machaon sachalinensis* Matsumura).

Papilio bianor **paradoxa** n. subsp.

A small race very closely resembling *P. bianor* forma *japonica* Butler, but differing from it as follows: Hindwing broader, with costal margin only slightly shorter than inner margin; the area covered by blue-green scales on the upperside of hindwing more extensive, and the black area inside of the submarginal series of blue-green lunules very greatly reduced. Underside: the ill-defined pale yellow postdiscal band of forewing somewhat narrower and tends to become very obscure toward the anterior margin; hindwing less densely but more widely sprinkled with yellowish atoms, the red lunules usually smaller. Length of body: ♂ ¾–♀ 1 1/16 inches; expanse of wings: ♂ 3¼–♀ 3½ inches.

Habitat: Saghalien.

Holotype: ♂, Shimizu, Saghalien, July 27, 1922 (Teiso Esaki); allotopotype, ♀; paratypes: 4 ♂'s and ♀, Toyohara and Higashi-schiraura, Saghalien, various July and August dates, 1922 (Teiso Esaki). Types in my collection.

Regarding *Papilio maackii* Ménétriés, Verity says: "Diffère du *bianor* par la coupe plus èlancèe des ailes; le bord costal des posterieures est un peu plus long que le bord abdominal, tandis que chez le *bianor* il est plus court. Les atomes verts des premières ailes se resserrent pour former une bande étroite transversale plus claire, que se prolonge aussi à travers les posterieures, où elle devient très nette; cette bande ne s'observe jamais chez le *bianor*; les lunules ne sont que très rarement teintées de rouge, comme chez cette espèce, et moins representée en dessous sur les quatre ailes par un semis d'écailles jaunâtres, qui n'existe jamais chez le *bianor* (Rhopalocera Palaeartica, p. 12)." It is of interest to note that *paradoxa* is more like *maackii* as regards the shape of the wings, yet it has none of the latter's colorational characteristics. Very likely, *maackii* and *bianor* are not specifically separate.

I take this opportunity of expressing my hearty thanks to Prof. Teiso Esaki, of Kiushiu Imperial University, Fukuoka, Japan, not only for the specimens dealt with in this paper, but also for many other rarities of the Far Eastern butterflies which he has so kindly placed at my disposal in the past.

A NEW ENICOCEPHALUS

(Hemiptera-Heteroptera).

By Stephen C. Bruner, Santiago de Las Vegas, Cuba.

Enicocephalus dominicus n. sp.

Dull sanguineous; hemelytra dusky, the costal margin and veins at base reddish; antennae strongly infuscated, apex of terminal segment pale; rostrum and legs dull orange-yellow, deeper on femora, intermediate and posterior tibiae and tarsi infuscated, paler at apex. Body clothed with short pale pilosity, more abundant below and on appendages. Posterior lobe of head narrower than distance across eyes, broader than long, strongly elevated above anterior lobe, unimpressed; eyes and ocelli large, dark red; antennae long, reaching well beyond apex of scutellum, slender, first joint short, thickened, second joint nearly twice as long as the first, third joint very long, longer than other three joints together, fourth joint slightly more than one-half the length of third, all rather strongly pilose, especially the third and fourth joints. Anterior lobe of pronotum short, slightly more than one-half the width of intermediate lobe, which is distinctly narrower and somewhat shorter than posterior lobe, the latter broadly and rather strongly emarginate behind; intermediate lobe divided above by usual deep T-shaped sulcus. Scutellum smooth, moderately convex. Hemelytra rather broad, discoidal cell closed, elongate. Legs slender, anterior femora and tibiae moderately incrassate, anterior tarsi with a single long slender claw. Length 4 mm.

Type from Long Ditton, Dominica, B. W. I., June 20, 1911; in Collection American Museum of Natural History.

ECOLOGICAL OBSERVATIONS ON RHYNCHOPHORA IN SOUTHERN PINES, N. C.

By Abram Herbert Manee.

Helops carolina n. sp.

Color, piceus-brown, upper parts polished but without the metallic sheen so common to the genus, under parts more reddish brown, labrum and tarsi lighter with tawny or gray pilosity; head with the usual depression between antennae finely and profusely punctulate; antennae about 3 mm. in length, gray pubescent; thorax finely and profusely punctulate, frontal edge smoothly evenly subcylindrical, frontal corners extending each into a dull spur behind which the costal edges round evenly to the full rounding basic corners whence the basic edges round outward and upward; entire thoracic surface smooth except that a broad pronounced depression near the costal edge occurs slightly post-medial; elytra suboblong-ovate, the costal edge depressed so that the greatest medial fullness is at striae 7 to 8, frontal edge smooth and rounding at shoulder, striae not deep but decided and fully finely punctulate, intervals subconvex with scattered shallow punctules, the striae 5 and 6 meeting at apical fourth; legs, tarsi and interior of tibiae profusely pilose. Length, 7.5 mm.–8 mm.; width, 3.4 mm. Habitat, at the base of black-gum trees or under boards on moist ground.

Collecting Dates and Habitats of Some Local Rhynchophora.

Auletes ater Lec.—Mid-April–early May. Dogwood.
Eugnamplus angustatus Hbst.—Late April. Dogwood.
Rhynchites hirtus Fab.—May. Dogwood.
Rhynchites aereus var.—Late May–June.
Pterocolus ovatus Fab.—May. Dogwood, Jersey tea (*Ceanthus*).
Attelabus analis Ill.—May. Oak-bush.
Attelabus nigripes Lec.—August. Sumac. (*Rhus typhina*) May.
Attelabus bipustulatus Fab.——Late April. Dogwood, oak.
Panscopus erinaceus Say—December, January. Base of hickory.
Pachnaeus distans Horn.—June–August. Persimmon-bush.
Pandeletejus hilaris Hbst.—Four varieties. April, May, June. Dogwood, Jersey-tea. Varieties of *P. hilaris*—*a*—light-reddish brown, 4 whitish, vertical stripes on thorax and the

usual elytral markings; *b*—like *a* but dark-brown; *c*—nearly black-elytral marks broad; *d*—small, very dark, clear-dark or finely sprinkled.

Aramigus fulleri Horn—June–July. Rose.
Plectromedes armatus Casey—June–July. Oak-bush.
Apion segnipes Say—April. Dogwood, hickory.
Apion varicorne Smith—May–Febr. Seeds of *Petalostemon corymbosum.*
Apion rostrum Say—April.
Apion crassum Fall.—May–June. Oak-bush.
Apion perfoveicollis Fall.—May, June, July. Oak-bush.
Apion sp.?—July. Unique. Hickory.
Phytonomus punctatus Fab.—September.
Macrops hornii Dietz—May.
Pissodes strobi Peck—January–February. Pine-twigs.
Pachylobius picivorus Germ.—March to June. Pine, pine-lumber.
Hylobius pales Hbst.—Winter and Spring. Pine, pine-lumber.
Hilipus squamosus Lec.—June. Unique. Oak.
Lixus scrobicollis Boh.—March, May, June, July.
Cleonus carinicollis May—On sunny sand.
Brachybamus electus Germ.—Unique.
Smicronyx apionides Casey—June.
Otidecephalus chevrolatii Horn—May–June. Hickory, oak.
Magdalis barbita Say—June. Very rare.
Anthonomus quadrigibbus Say—April. Wild cherry.
Anthonomus signatus Say—June. Cedar.
Anthonomus flavicornis Boh.—May–June. Oak.
Anthonomus disjunctus Lec.—March.
Anthonomus grandis Boh.—October. Cotton-bolls.
Orchestes pallicornis Say—May. Oak-bush.
Orchestes niger Horn—May–June. Oak-bush.
Elleschus ephippiatus Say—June.
Prionomerus calceatus Say—June.
Encalus decipiens Lec.—October, June.
Tichius arator Gyll.—May. Rare.
Gymetron teter Fab.—May. Mullein.
Laemosaccus plagiatus Fab.—May. Dogwood, oak.
Conotrachelus nenuphar Hbst.—April to June. Peach.
Conotrachelus seniculus Lec.—May–June.
Conotrachelus elegans Say—September.

Conotrachelus cribricollis Say—March.
Conotrachelus anaglypticus Say—June.
Conotrachelus leucophaeatus Fabr.—November.
Rhyssematus lineaticollis—June. Milk-weed.
Chalcodermus aeneus Boh.—April–July. Cowpea pods, Lupine.
Chalcodermus inaequicollis Horn—March. Lupine.
Chalcodermus collaris Horn—May–June. Lupine.
Acamptus rigidus Lee—January.
Tyloderma aereum Say—May–August. On stalk of *Sagittaria.* Rises to top of water when jarred.
Phyrdenus undatus Lec.
Cryptorhynchus bisignatus Say—April, May, February. Bush.
Cryptorhynchus fuscatus Lec.
Cryptorhynchus obliquus Say—March. Base of trees.
Cryptorhynchus obtentus Hbst.—May. Rotten wood.
Cryptorhynchus fallax Lec.—June. Base of rotten oak.
Cryptorhynchus tristis Lec.—March. Rotten roots.
Piazurus oculatus Say—May. Dogwood.
Capturus minutus Lec.—July.
Tachygonus lecontei Gyll.—April. Dogwood, Gum, oak.
Craponius inaequalis Say—May to August. Oak-bush.
Acanthosalis curtus Say—May. Dogwood.
Rhinoneus pyrrhopus Lec.—June.
Baris subovalis Lec.—July. Oak-bush.
Baris near *transversa* Say—*cribrifera* Casey—May–June.
Baris confinis Lec.—May–June, October.
Baris sp.?—May.
Onychobaris rugicollis Lec.—Rare.
Odontocrynus adjunctus Casey—June.
Centrinus scutellum-album Say— June. Indigo-plant.
Centrinus picumnus Hbst.—April. Dogwood, oak.
Centrinus concinnus Lec.—April.
Centrinus rectirostris Lec.—June.
Centrinus finitimus Casey—May–July. Dogwood.
Anacentrus ovulatus Casey—June. Very rare.
Limnobaris puteifer Casey—May–June.
Stethobaris ovata Lec.—September. Rare.
Balaninus uniformis Lec. var. *caculi.*—September. Acorns.
Balaninus quercus Horn—May, July–November. Oak.
Eupsalis minuta Drury, var. *sallei*—March–December. Rotten gum.

Rhodobaenus tredecempunctatus Ill.—June. Oak.
Sphenophorus retusus Gyll.—May–June. Hard sand.
Sphenophorus germari Horn—May to August. Hard sand.
Sphenophorus sp.?—May to August. Hard sand.
Sphenophorus venatus Chit.—May–June. Hard sand.
Calandra oryzae Linn.—March–November. Grain.
Calandra granaria Linn.—March. Grain.
Dryophthorus corticalis Say—May. Very rare.
Cossonus corticola Say—May, June, November, December. Pine-bark.
Rhyncholus angularis Lec.—May. Only one specimen.
Eurymyctes fasciatus Oliv.—January. Fungi. Rare.
Tropideres bimaculatus Oliv.—Winters in rotten dogwood.
Anthribus cornutus Say—June. Fungi. Rare.
Cratoparis lunatus Fab.—Winters in tree-fungi.
Cratoparis lugubris Oliv.—Winters in rotten gums.
Brachytarsus stictitus.—June. Oak-bush.
Araeocerus fasciculatus D. & G.—May–September. Fungi.

A New Locality for Copaeodes minima Edwards.—Among some specimens recently received from Mr. G. P. Engelhardt there is a male specimen of *Copaeodes minima* Edwards (*rayata* Barnes and McDunnough), taken by Mr. W. C. Dukes at Mobile, Alabama, on July 23; this I believe is a new locality for the species.—E. L. Bell, Flushing, N. Y.

Libythea bachmani in Long Island.—A male specimen of *Libythea bachmani* Kirtland in perfect condiiton was taken at Coram, Suffolk County, Long Island, New York, on June 10, 1923; when found it was visiting the flowers of a running blackberry vine.—E. L. Bell, Flushing, N. Y.

CALIFORNIA BUTTERFLY NOTES—II.

By Karl R. Coolidge, Hollywood, California.

Papilio zelicaon Lucas.

Carrots, turnips and parsnips serve as food-plants for this species, and also orange and lemon trees, to which I called attention in Pomona Journ. Ent., p. 33, 1910. In the San Joaquin Valley citrus trees form an important factor as larval food, but much less so about Los Angeles, only two or three instances having been reported here. In addition, the following food-plants are known to me:

Ammiaceae.

Carum kelloggi Gray.—A commonly used food-plant in the San Francisco Bay region.

Carum gairdneri (H. & A.) Gray.—In Ventura County.

Foeniculum foeniculum (L.) Kaisert (= *vulgare* Gaertn.).—Sweet Fennel, a native of Europe and long ago introduced to California. This seems to be everywhere the preferred food.

Daucus pusillus Michx.—Rattlesnake Weed. A popular food-plant throughout the chaparral belt.

Eulophus bolanderi C. & R.—In the damp meadows of the higher mountains.

While the life history of *zelicaon* has been published a number of times, I can find no detailed description of the egg, and so offer the following:

> *Egg:* Nearly globular, broader than high, the base sharply flattened, the summit broadly rounded. The surface covered with excessively fine granulations. The micropyle in a flat circular obscure field, scarcely depressed; the micropylar cells round, very minute, about .005 mm. in diameter.
>
> Color, when first laid, a very pale greenish yellow, but the green soon becomes lost and the coloration is then uniformly a pale honey yellow. In three or four days the egg becomes blotched with reddish brown, a jagged circular band appearing about the middle, and a distinct even edging about the micropyle; where the surface is unblotched the coloration is a sordid gray. Finally, just before the young larva emerges the egg becomes a solid deep purple.
>
> Base .86 mm. in diameter, but varying slightly. As in other *Papilios* there is considerable variation in the diameter

and height, six eggs from the same female showing the following:

1.—	Diameter	1.20 mm.	Height	1. mm.
2.—	"	1.08 mm.	"	1. mm.
3.—	"	1.08 mm.	"	.92 mm.
4.—	"	1.10 mm.	"	.94 mm.
5.—	"	1.10 mm.	"	1. mm.
6.—	"	1.16 mm.	"	1. mm.

Euphydryas chalcedona Dlb. & Hew.

A new food-plant for this species is *Collinsia bicolor* Benth., popularly known as "Chinese Houses," upon which I found numerous larvae feeding in Ventura County, 1918.

Melitaea gabbi Behr.

Melitaea gabbi Behr is known from California, Utah, Nevada and Arizona. It is a common vernal species in Southern California, occurring as far north along the coastal region as Pacific Grove, in Monterey County. About Los Angeles it is one of the early spring butterflies, usually appearing in the first week of March, but is not out in full force until the latter part of that month, or in early April.

Gabbi has always been considered a single brooded species but occasional captures made in later months caused me to believe that at least in part it was double brooded. In 1921, in a spot near Hollywood where the butterfly is quite abundant, I made a careful check of its appearances.

The spring of 1921 was an unusually late season, and the first appearance, a ♂, was noted April 2. By April 7 a number were out, and the 15th saw the species in full flight. From then on I visited the spot almost daily, and by May 2 the brood had entirely disappeared.

But on July 1 six perfectly fresh specimens were captured and others seen. On July 6 fourteen more were netted, including several pairs in copulo. Again, on July 13, more examples were observed, now showing signs of wear and tear. From these records it is very apparent that in the lower coastal region about Los Angeles *gabbi* is at least partially double brooded. But whether these imagoes were the product of the first brood, or from hibernating larvae of the previous season, is another question. If from hibernating larvae, then the individuals of the earlier generation may have issued from over wintering pupae. Is there any such instance known in our species of *Melitaea?*

All that is known of the life history of *gabbi* is a very meager description of the pupa by Minot, Ent. News, Vol. 13, p. 158, 1902. California collectors have considered that Owl's Clover (*Orthocarpus purpurascens* Benth.) is the food-plant of *gabbi.* The haunts of the butterfly are in the localities where this plant grows, and year after year I have noted that the appearance of the adults of *gabbi* is nicely in keeping with the blossoming of Owl's Clover. Yet repeatedly, season after season, I have confined gravid females of *gabbi* with plants of Owl's Clover, only to have them die without ovipositing.

My experience with the species of *Melitaea* is that those which lay their eggs in masses will deposit eggs freely in confinement, even when no sprigs of the proper food-plant are present. Several instances are known where *chalcedona* ♀♀ have come to life in papers and deposited eggs, and on other occasions supposedly dead females have laid eggs in the grooves of spreading boards. But those species which lay their eggs solitarily are a very different problem. I confined ♀♀ of *wrighti* for years before I could obtain eggs, one ♀ laying three or four more by accident than anything else.

On July 7, 1921, a pair of *gabbi* were taken in copulo and confined with *Orthocarpus.* They remained attached until the following day, and on April 10 the ♀ deposited seventy eggs, all laid in jumbled masses on the bottom of the confinement jar, the butterfly completely ignoring the *Orthocarpus.* On April 24 the eggs hatched, making this period fourteen days. I gave them fresh sprigs of *Orthocarpus,* but they refused to even consider it. Other Scrophulariaceae were then offered, plants found in the habitat of *gabbi,* these being *Diplacus longiflorus* Nutt., *Mimulus* species, and *Castilleia foliolosa* H. & A., but all were spurned, and two days later the last of the larvae passed away. The following descriptions were made:

> *Egg:* Subglobular. The base broadly but evenly rounded, .40 mm. in diameter, rounding out thence to the greatest breadth, .54 mm., in the middle of the lower half of egg. From this point decreasing evenly and rather rapidly to the summit, which is truncate, and but .24 mm. in diameter.

Arising in the upper third of egg a series of weak irregular ribs, at their origin .08 mm. apart, and the ribs themselves .018 mm. in thickness. The surface between them deeply concave, glistening, and traversed by some exceedingly faint cross striae, which basally form rather even quadrate cells, about .03 mm. in their shorter width. The lower two thirds of egg marked with numerous shallow punctulations, mostly circular or pentagonal, caused by scarcely raised lines. The surface contained in these cells exceedingly finely punctate. The micropyle in a deep circular pit, not greatly depressed, .20 mm. in diameter, and surrounded by the uneven terminations of the longitudinal ribs.

Color, when first laid, pale green, in some lights with a yellow tinge. The coloration is almost exactly that of the tender leaves of *Orthocarpus*. Height .60 mm.

Larva at Birth: Head .32 mm. in diameter, dark brown, shining; with a fringe of fine sharp, weak colorless spiculiferous hairs, .06 mm. in length and anteriorly projecting.

The usual round smooth warts, .03 mm. in diameter, arranged in the following series:

A laterodorsal row, centrally located; a lateral row, in middle of posterior half of segment; a suprastigmatal row centrally located; an infrastigmatal posterior; a ventrostigmatal anteriorly placed. On the thoracic segments all these series of warts become centrally located, or very nearly so.

The hairs arising from these warts .24 mm. in length, curving, finely pointed, brown in color, rather heavily spiculiferous.

Color of body a dull yellow, with a whitish sheen. Legs yellow brown, shining. Ventral surface and prolegs concolorous with body above. Spiracles round, with a fine fuscous ring. Length 1.20 mm. Width at first thoracic segment .26 mm.; width at anal segment .18 mm.

ON A FEW HETEROPTERA FROM MASSACHUSETTS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

In the early part of October, 1923, I spent a few days at Amherst, Mass., and while there, Dr. G. C. Crampton and Dr. C. P. Alexander very kindly conducted me to several likely collecting places. The season was quite far advanced; heavy frosts had killed vegetation. Moreover, the extremely dry summer of this year had made water (and other) collecting rather poor. In spite of this, however, some good things were secured.

Our first trip on the afternoon of October 8 was to Leverett, some ten miles from Amherst. Here steeple-bush yielded a couple of its usual denizen, *Ischnorhynchus geminatus* Say; sweeping in sedges produced one *Stenodema vicinum* Reuter; and on trees two third instar nymphs of *Zelus exsanguis* Stål were caught. Dr. Crampton netted in flight a *Phytocoris neglectus* Knight; and sycamore bark sheltered in good numbers the usual *Corythucha ciliata* Say. The pond, however, was in a sense more fruitful. A few *Notonecta undulata* Say were dredged by Dr. Alexander and myself; and one *N. variabilis* Fieber by the former, who also got a solitary *Mesovelia bisignata* Uhler, a very deep green apterous female. In a ribbon-like waterweed growing in shallow water, in the shadow of a boat, Dr. Alexander and I between us caught about two dozen *Ranatra kirkaldyi* Bueno, which was to be seen sluggishly swimming after the plants were disturbed by the net.

On the following day (October 9) we spent an hour in the afternoon at Cushman's, where in a little drainage ditch I got one small female Corixa, not identifiable by Abbott's keys. There were several of these in the flocculent ooze. Sweeping yielded the common *Lygus pratensis* L. in abundance and three *Lygus vanduzeei* Knight. *Stenodema vicinum* Prov. was common among the grasses. Steeple-bush harbored the usual *Ischnorhynchus,* but not many, as the bushes were heavily frost-killed. The grasses and sedges yielded an abundance of *Nabis rufusculus* Reuter; and on an upland meadow across the road, one *N. ferus* L. was caught. Golden rod, both on the boggy meadow and on the upland, yielded six *Crophius disconotus* Say. This seems to be the food plant of this insect, as also a favorable situation—that is—upland meadow contiguous to a boggy place. In the bog one *Kolenetrus plenus* Distant was secured. A roadside oak was badly infested with *Corythucha arcuata* Say, which had bleached many of the leaves. There were abundant eggs, together with nymphs and adults, still active. The flower heads of aster, golden rod and other autumn blooms, harbored many *Triphleps insidiosus* Say. In a corner of the field, among shrubbery, Dr. Crampton took one *Banasa dimidiata* Say; and I swept one *Peribalus limbolarius* Stål. *Ligyrocoris diffusus* Uhler, although present, was not abundant.

Later in the afternoon, a sand pit at North Amherst was quite good. *Nysius ericae* Schilling was not only running about on the sun-warmed sand, adults and nymphs, as usual, but it was also heavily clustered on the flowers of an everlasting. *Ortholomus scolopax* Say was in good numbers on golden rod; *Nabis ferus* L. was in the various plants, and one *Corizus lateralis* Say was swept. *Harmostes reflexulus* Say was another common form on the golden rod. *Lespedeza* harbored numbers of *Alydus eurinus* Say, *A. pilosulus* H. S. and *Megalotomus quinquespinosus* Say. Under a clump of small yellow birches, among the dry leaves, one *Corythucha marmorata* Uhler was found; and running fast, a couple of *Ptochiomera clavigera* Uhler. The day was fine, clear and warm, and there were quite a few insects in the air—mainly small beetles and plant lice.

Phytocoris neglectus Uhler and *Ptochiomera clavigera* Uhler merit special mention, as they have not been before reported from Massachusetts and are not recorded in Parshley's New England list, nor in the recently published Hemiptera of Connecticut. The others are new Massachusetts localities.

A short while later, Mr. C. A. Frost, of Framingham, Mass., kindly favored me with some bugs he had secured by sifting this past autumn, which he regarded as too ordinary to mention. In addition to *Myodocha serripes* Olivier and *Cymus discors* Horvath already reported from Framingham, the other (and greater part of the specimens) either add to the known distribution in the State; or are otherwise noteworthy. From Sherborn, on November 4, are these records: *Podops cinctipes* Say, two; *Drymus unus* Say, one; *Antillocoris pilosulus* Stål, one; November 18, same locality: *Cymus discors* Horv., one; *Nabis roseipennis* Reuter, two; *N. rufusculus* Reuter, one; and four *Lygus pratensis* L.

From Framingham, dated October 13, there is one *Corythucha pergandei* Heid. and two *Acalpyta thomsonii* Stål, and another from Sherborn, October 7.

Sifting continued good late in the season, owing to the very mild weather experienced well into December. So sifting leaves at the edge of a swamp and on the hummocks above the swamp level and at the base of grasses yielded on November 28 at Sherborn two *Heraeus plebejus* Stål, one *Pamera basalis* Dallas and one *Zelus exsanguis* Stål, nymph; *Cymus discors* Horvath was the most abundant bug, secured from among leaves along the edge of the swamp. The other species taken on this date were *Euchistus tristigmus* Say, *Thyreocoris pulicarius* Germar; one long-winged *Nabis roseipennis* Reuter; and one *Antillocoris pallidus* Stål. On December 1, sifting in open woods at the edge of a swale, in Sherborn, gave another *Acalypta thomsonii;* one apterous and one brachypterous *Nabis rufusculus;* two *Scoloposteihus diffidens* Horvath, and four *S. atlanticus* Horvath; one *Antillocoris pallidus* and numerous *Lygus pratensis;* and on December 2, one *Nabis roseipennis.* On December 8, these species were secured: *Cymus angustatus, C. discors, Ligyrocoris diffusus* Say, *Heraeus plebejus, Corythucha marmorata* Uhl. and *Podops cinctipes.*

All these are new localities for Massachusetts. *Acalypta thomsonii,* although not given in Parshley's New England list, was recorded from Massachusetts by McAtee, in Proc. Ent. Soc. Wash., xviii, No. 4, 219 (1916). It would seem to be not uncommon.

The four described species of *Acalypta* from the United States may be separated by the appended key, to amplify that given in Hemiptera of Connecticut, p. 698.

Key to Species of Acalypta.

1. Bucculae united anteriorly; lateral pronotal carinae markedly diverging posteriorly (explanate margins of pronotum anteriorly truncate, roundedly angular; discoidal area comparatively short and broad; general aspect *broad;* costal area biseriate in greater part; third segment of antennae not quite twice as long as fourth; length, 2.5–3 mm.). *thomsonii* Stål

Bucculae separated anteriorly; lateral pronotal carinae slightly diverging posteriorly, subparallel 2

2. Third segment of antennae nearly twice as long as fourth; pronotal margins angularly dilated behind middle (discoidal area short; length, 2.9 mm.) ....*cooleyi* Drake
Montana.

Third segment of antennae nearly or more than three times as long as fourth; pronotal margins rounded (costal area uniseriate) 3

3. Third segment of antennae more than three times as long as fourth; discoidal area long and narrow, apex rounded; general aspect narrow; color black; length, macropterous, 3 mm., brachypterous, 2.3 mm. ....*lillianis* Bueno
Maine, Massachusetts New York,
Maryland, North Carolina.

A NEW NORTH AMERICAN SPECIES OF AMIOTA LOEW (Diptera).

By J. R. Malloch, Washington, D. C.

The type specimen of the species described below is in the collection of the Natural History Survey of Illinois.

Amiota setigera sp. n.

Male.—Black, slightly shining. Frons shining, when seen from in front, upper half black, lower half yellowish; face and cheeks yellowish, lower half of former ivory white; antennae and palpi yellow; labrum fuscous. Dorsum of thorax with dense grayish pruinescence, more shining on sides, the usual ivory white humeral and pleural spots conspicuous. Abdomen concolorous with thorax, not yellowish anywhere. Legs, including coxae, tawny yellow. Wings hyaline, veins pale brown. Bristles and hairs all luteous. Frons twice as long as its anterior width, widened posteriorly. Thoracic chaetotaxy as in *humeralis* Loew. Hind femur with about five long yellow bristles near middle on posteroventral surface which are much longer than the diameter of femur; none of the tibiae with erect hairs. Inner cross-vein slightly before middle of discal cell; fifth vein more pronouncedly deflected beyond outer cross-vein than in the other species, forming with it a slightly angulate line; venation otherwise as in *humeralis*.

> Female.—Similar to male, but frons broader and shorter, third antennal segment brownish, and hind femur without long posteroventral bristles.
>
> Length, 2.25–3 mm.

Type, male, Savoy, Ill., May 23, 1916, at sap exuding from apple tree. Allotype and two female paratypes, White Heath, Ill., August 12, 1920, flying round collector's face. One male paratype, Dubois, Ill., June 5, 1920. All collected by the author.

In a short paper in *Entomological News* in 1921 I erroneously identified this species as *humeralis* Loew. In a paper on the Drosophilidae of the District of Columbia by W. L. McAtee and the present writer, now ready for the press, a key to the species of this genus is included.

A BIRD IN A SPIDER WEB.

By Stanley W. Bromley, Amherst, Mass.

On the afternoon of the 15th of September, 1921, the attention of the writer, who was collecting along a stream in Southbridge, Massachusetts, was attracted to a small bird feebly fluttering, apparently in mid-air. A closer examination showed that it was securely held in a large spider web that extended between two small alder bushes. As no incident of like nature had ever been observed by the writer, it was considered worthy of note to record the conditions under which the entanglement of a bird in a spider web would have come about.

The bird, a field sparrow (*Spizella pusilla* Wilson), apparently a young bird of that season, was held securely at the base of the primaries of the right wing by the heavy bridge of the web, which was extremely strong and wire-like. Many of the bird's feathers were broken, and its whole plumage ruffled and covered with the viscid threads from the web. That the bird had been in the web for many hours, possibly a day or so, was probable, as testified by the dried excrement on the foliage below the web. Continual struggling had exhausted the captive and broken several primaries, leaving it scarcely able to fly. It was released from the web and, after remaining in the writer's hand for a minute or so, fluttered a distance of about ten feet into a low bush, where it remained in a drooping position, feebly grasping the branch upon which it had alighted. If undisturbed, it probably would have succumbed in the web or fallen prey to some carnivorous animal or bird. I doubt, now, whether it was able to survive the migration.

The web was located in a swale along the border of the brook, among the rank-growing Joe Pye weeds, young alders, and other herbage. It was the web of a large orbweaver, probably *Aranea trifolium,* which was abundant in that locality and whose strong webs were in evidence all along that particular brook, the spider lurking under a leaf at the edge of the web. In the web that held the bird captive, no spider was to be seen, nor could it be found in its retreat among the folded leaves of the shrub to which the web was attached, although a careful search for it was made. The struggles of so large an object in its web had evidently frightened it so that it had dropped to the ground and left the neighborhood altogether.

There are several instances of birds becoming ensnared in spider webs mentioned in literature, and in one case the bird was recorded as actually being killed by the spider. McCook (American Spiders and their Spinning Work, 1889, Vol. I, p. 235) cites several reports of birds becoming entangled in the strong webs of the large orbweavers of the tropics, probably species of *Nephila.* Nearer home he mentioned a report of a kingster (kinglet?) ensnared in the web of what was probably *Argiope cophinaria* (*Miranda aurantia*) near Philadelphia. Another instance was cited near Philadelphia of a hummingbird ensnared in the web of the same species. Here the spider was recorded as swathing the victim, which when taken from the web was found to be dead. In most cases, however, it is probable that the spider would be frightened by the presence of so large a capture and abandon the web.

EDITORIAL.

Entomology in Non-Entomological Publications.

Entomology is a vast subject in all its aspects. This brings with it a formidable literature of comprehensive works, monographs and journals strictly devoted to the science in some one of its many forms. The working entomologist is compelled to keep in touch with these, and the specialist must have them available.

Specialization in insects, owing to the limitless number of their species, daily grows more technical and more complex, as well as more restricted. But insects *per se* are no longer a sole object of study. Owing to their availability as material for biological research and to their importance as commensals with man and also his parasites—in which last aspect they serve as carriers of contagion—they are studied likewise by biologists, cytologists, evolutionists, agriculturists, parasitologists, and finally, doctors of medicine. All these scientists have publications of all kinds of their own. And in these they publish the results of their researches in their own special fields. But not content with this, these specialists likewise dabble in pure entomology, and publish on taxonomy, nomenclature and in other exclusively technical entomological lines. At times they fulminate *ex cathedra* on all these subjects, and settle off-hand vexed questions that have bafflled entomologists for many decades.

Not content with these occasional incursions into fields assiduously cultivated by entomological specialists—which, of course, in the freedom of science they have a perfect right to do without let or hindrance—they proceed to publish these techincal entomological results in journals and other media familiar to them and to their fellow-specialists in parasitology, or what-not, but utterly unknown to entomologists. Thus we see medical journals in all languages carrying revisions of genera, cytological reviews discussing entomological nomenclature, parasitological publications describing new species. In this view and practice, we may expect to see aquatic insects treated of in technical magazines on hydraulic engineering; or crop forms discussed in the Journal of the Society of Chemical Industry.

It stands to reason that entomologists, whether official or unofficial, cannot be in touch with *all* sciences and arts. Neither have they the time to read nor the funds to acquire all journals of morphology, cytology, behavior, parasitology, zoology, botany, geology, chemistry, engineering, medicine, in which some author may suddenly publish important data on insects; not to mention general works on biology and medicine and their more abstruse offshoots.

So we predict that the time is at hand when systematic biologists at large and entomologists in particular, must draw up a rigid definition of what constitutes publication of new forms and what makes valid revisional, monographic, or nomenclatorial work. And we further predict that such a definition will exclude in terms all publications except such as are dedicated to systematic zoology as a whole, or in its branches.

And because of the difficulty in securing these out-of-the-way revisons, we personally hope the day may not be long delayed.

This is not a captious criticism of the activities of non-entomologists. We merely point out one consequence of their labors.

J. R. T. B.

One of the most beautiful red gold butterflies of the world—

Chry. virgaureae—for only 6 cents each, as long as the stock lasts. Other small species for decorative purposes at 2 cents to 5 cents each; and also exotic Lepidoptera.

Our New List of Books, Pins, Apparatus and Supplies free.

Our Price List No. 58 contains 28,000 species of Lepidoptera, the greatest and most extensive of all lists $1.00

Price List No. 30 contains 30,000 species of Coleoptera .... .50

Price List No. VII, 10,000 species of other insects .... .50

Price of the catalogue will be allowed for in billing orders for Insects.

Kindly send price in dollar bills; or in postage stamps.

DR. O. STAUDINGER & A. BANG-HAAS
BLASEWITZ, DRESDEN, GERMANY

An Introduction to Entomology

By JOHN HENRY COMSTOCK, Professor of Entomology and General Invertebrate Zoology, Emeritus in Cornell University.

PART I—The Structure and Metamorphosis of Insects

This volume is the first part of a text-book of entomology that Professor Comstock has in preparation. It is, however, a complete treatise on the structure and metamorphosis of insects. The part now published includes four chapters. The first chapter is entitled "The Characteristics of Insects and Their Near Relatives." In this chapter the characteristics of the Arthropoda and of each of the thirteen classes of arthropods is discussed, with figures of representatives of each of these classes. The second chapter is devoted to a detailed discussion of the external anatomy of insects. The third chapter treats of the internal anatomy of insects and includes the results of recent investigations in this field. In the fourth chapter there is a detailed account of the transformation of insects, in which each of the different types of metamorphosis of insects is discussed. There is also included a bibliography and an index.

Pages, xviii + 220, with 220 illustrations. Bound in cloth. Price, $2.50 net.

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

PAPUAN INSECTS.—Will collect Coleoptera, Lepidoptera and other orders. Correspondence promptly answered. T. K. Scheibel, c/o G. A. Loudon & Co., Port Moresby, Papua.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 81 Robert St., Toronto, Ont., Canada.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

OFFER.—Bred adult specimen of *Catocala herodias* in exchange for ova of species of same genus. Parent moth with ovum preferred. G. J. Keller, 68 Treacy Ave., Newark, N. J.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

WANTED.—Offers on bright-colored butterflies and moths for use in trays and pictures. Mrs. Robert Milde, Lewiston, Minn.

XIX JUNE, 1924 No. 3

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

JUN 2 1924

NEW SERIES

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed May 28, 1924

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1924

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
HOWARD NOTMAN

CONTENTS

THE CRANE–FLIES OF N. Y., Alexander 57
ATRACTOTOMUS MALI IN NOVA SCOTIA, Knight 65
NEW ANKOTHRIPS FROM MEXICO, Hood 66
TO LEPIDOPTERISTS AND COLEOPTERISTS, J. R. T. B. 68
ANNECTANT CIMICOIDEAE, McAtee and Malloch 69
PARSLEY WEEVIL, A POTENTIAL PEST, Chittenden 84
NEW LOCALITY FOR PAMPHILA MESKEI, Bell 86
TWO NEW SPECIES OF CYMUS, Barber 87
OAK APPLES DESTROYED BY GRAY SQUIRRELS, Davis 91
CORRECTION IN ACALYPTA, Torre-Bueno 93
NEW ACANTHOCHEILA FROM BOLIVIA, Drake 94
EXTERNAL INSECT–ANATOMY: A REVIEW, Parshley 95
EDITORIAL: ON "N. SP.," J. R. T. B. 99

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XIX June, 1924 No. 3

THE CRANE-FLIES OF NEW YORK: SECOND SUPPLEMENTARY LIST.

By Charles P. Alexander, Amherst, Mass.

The first addition to the general list of the Tipuloidea of New York State was published in this Bulletin (Vol. 17: 58–62, 1922). The following additions and corrections are the result of collections made chiefly in 1923, by Drs. Crampton and Leonard and the writer.

The additions to the list of New York Crane-flies are as follows:

278 *Antocha opalizans* Osten Sacken. This species has long been considered as being a synonym of *A. saxicola* Osten Sacken, and was so held in the general list of 1919. There is no doubt, however, that the two species are entirely valid. The following records certainly pertain to true *opalizans:*

Albany County: Helderbergs, June 5, 1923 (C. P. Alexander).

Essex County: Keene Valley, August 13, 1920 (Howard Notman).

279 *Molophilus cramptoni* sp. n.

Rensselaer County: Brookview, June 20–30, 1923 (C. P. Alexander).

280 *Molophilus quadrispinosus* sp. n.

Tompkins County: Needham's Glen, Ithaca, June 4, 1921 (C. P. Alexander).

(183) *Rhaphidolabis* (*Plectromyia*) *confusa* sp. n. This species was recorded as being *R.* (*P.*) *modesta* Osten Sacken in the general list of 1919. The latter is known only from the White Mts., N. H.

Albany County: Helderbergs, June 5, 1923 (C. P. Alexander).
Erie County: Holland, May 21 (M. C. VanDuzee).
Fulton County: Mountain Lake, June 13, 1916 (C. P. Alexander).

281 *Rhaphidolabis* (*Rhaphidolabis*) *forceps* sp. n.
Albany County: Helderbergs, June 5, 1923 (C. P. Alexander).
Rensselaer County: Brookview, June 16, 1923 (C. P. Alexander).

282 *Tipula centralis* Loew.
Albany County: Helderbergs, June 18, 1923 (C. P. Alexander).
Essex County: Mt. McIntyre, at less than 4,000 feet, July 1, 1923 (M. D. Leonard).

Before describing the four new species mentioned above, the writer would like to discuss briefly two of the most interesting localities for Tipulidae in Eastern New York.

The Helderberg Mountains, Albany County.

The magnificent escarpment known as the Helderbergs is largely included within the 350 acres of the John Boyd Thacher State Park, the superintendent of which is the Entomologist, Mr. John H. Cook. This long and narrow park contains most of the cliffs of the Helderbergs, including the Indian Ladder. The park is easily reached by automobile from Albany, via the state road through Altamont. By train, one may take the D. and H. line from Albany to Meadowdale, whence a two mile walk and climb leads to the Indian Ladder. In the general list of 1919 several Helderberg records were included. During the season of 1923 the writer was twice able to visit this splendid collecting ground, the first time on June 5th, in company with Dr. G. C. Crampton, the second on June 18–19, when the writer climbed the cliffs and spent the night in the large cave near the Ladder. The results of these two trips may be briefly summarized:

On the 5th: *Dicranomyia badia; D. pudica; D. liberta,* one being the prey of an Empid; *Geranomyia rostrata; Limonia cinctipes; Antocha opalizans; Erioptera* (*Empeda*) *stigmatica; Molophilus hirtipennis; Gonomyia subcinerea; Epiphragma fascipennis; Dactylolabis montana,* abundant on the cliffs; *Limnophila subcostata,* one the prey of an Empid; *L.* (*Prionolabis*) *rufibasis;*

L. areolata; Pilaria quadrata; Adelphomyia minuta; Tricyphona inconstans; Rhaphidolabina flaveola; Rhaphidolabis (*Plectromyia*) *confusa* sp. n.; *R.* (*R.*) *forceps* sp. n.; *Tipula trivittata; T. margarita:* This rare species was hitherto known only from the unique type ♂ taken in Tompkins County in June. A few of both sexes were found in the piney woods at the foot of the trail leading to the top of the cliffs, the first observed specimen being noted walking across the road by Dr. Crampton. All specimens taken, representing both sexes, were observed fluttering along, only a few inches above the ground. On the 18th, careful search was made for them but they had quite disappeared; *T. submaculata; T. iroquois; T. angustipennis; T. senega; T. serta; T. tephrocephala; T. cayuga; Nephrotoma incurva.*

By the 18th, the character of the Tipulid fauna of the Park had changed materially, as shown by the following list of captures: *Dicranomyia badia; D. pudica; D. simulans; Limonia cinctipes; L. indigena; Helius flavipes; Molophilus pubipennis; M. hirtipennis; M. ursinus; Ormosia deviata; Gonomyia subcinerea; Tricyphona inconstans; Pedicia albivitta; Rhaphidolabina flaveola; Dolichopeza americana; Oropeza venosa; Tipula abdominalis* (larvae); *T. oropezoides; T. cayuga; T. hermannia; T. centralis,* the first record of this Northern fly for the State; *T. senega; T. macrolabis; T. serta; T. trivittata; T. valida; T. fuliginosa,* and *T. submaculata.*

Becker's Woods, Brookview, Rensselaer County.

This interesting bit of woodland lies along the Moordenerkill, a stream of moderate size that eventually finds its way into the Hudson a few miles below Albany. The ends of the woods are high and dry but midlength of the area lies a triangular portion that is swampy, traversed by several small, clear trout streams. This latter portion of the woods was found to be especially rich in Tipulidae. In June it is covered with great numbers of skunk cabbage, seedlings of *Impatiens,* and, in fewer numbers, golden ragwort. Towards the uplands, considerable yew enters in and on the higher and dryer portions becomes dominant, though skunk cabbage is found scattered about almost throughout the woods. By the end of June the *Impatiens* has virtually overtopped the skunk cabbage.

The forest cover of this swampy area includes the dominant hemlock and yellow birch, and in fewer numbers, white pine, butternut, basswood, red and sugar maples and white ash. Among the shrubs and low trees, yew, as described above, is dominant, with lesser numbers of blue-beech, witch hazel and spice-bush entering in. The ground-cover, besides the dominant skunk cabbage and *Impatiens,* includes an abundance of *Chrysosplenium* in the hollows, sensitive and cinnamon ferns, the latter on dryer spots, and as lianas, poison ivy and woodbine. The Tipuloidea occurred in great abundance in this swampy portion, being especially abundant in the tension zone where the skunk cabbage is replaced by yew. The crane-flies noted in this area of Becker's woods, June 7–21, 1923, are as follows:

Dicranomyia immodesta; D. pubipennis; D. liberta; Limonia solitaria; Antocha opalizans; Erioptera venusta, dominant; *E. caloptera; E. stigmatica; E. septentrionis; E. megophthalma; Gonomyia florens; G. cognatella; G. blanda; G. subcinerea; Molophilus pubipennis; M. cramptoni* sp. n.; *M. ursinus; Ormosia pygmaea; O. nigripila; Epiphragma fascipennis; Limnophila alleni:* Only a few scattered individuals of this magnificent fly, taken on the 7th, 9th and 21st. They rest with the wings incumbent, legs spread, on the upper side of leaves of skunk cabbage; *L. tenuicornis; L. subtenuicornis; L. macrocera; L. rufibasis,* dominant; *L. areolata; L. fuscovaria:* Dominant, resting with wings incumbent, on leaf, the head held close to the resting place, the abdomen tilted upward at an angle of about 45°; *L. brevifurca; L. subcostata; L. sylvia:* Swept from the low vegetation along trout streams; noted flying low over damp spots in the woods, ♂♂ only; *L. adusta,* variety; *L. lenta; Pilaria tenuipes; P. recondita; P. quadrata; P. stanwoodae:* In yew zone; *Pseudolimnophila luteipennis; P. nigripleura; P. toxoneura; Adelphomyia minuta; Ulomorpha pilosella; Tricyphona calcar; T. inconstans; Rhaphidolabina flaveola; Liogma nodicornis; Oropeza venosa; Tanyptera topazina; Tipula oropezoides; T. bella; T. strepens; T. collaris; T. serta; T. senega; T. trivittata; T. valida; T. abdominalis; T. collaris; T. tephrocephala; T. cayuga; T. tricolor; T. submaculata; T. hermannia; Nephrotoma euceroides; N. lugens; N. tenuis; Ptychoptera rufocincta; Bittacomorphella jonesi; Bittacomorpha clavipes.*

On the edges of the woods, where the Moordenerkill flows along it, occurred: *Dicranomyia simulans; Gonomyia mathesoni; Cryptolabis paradoxa; Eriocera spinosa; Oropeza albipes.*

On June 11th, in the higher and dryer parts of the woods, the following additional species occurred: *Limonia triocellata; L. indigena; Gonomyia manca; Erioptera armata; Ormosia deviata; Elephantomyia westwoodi; Tipula fuliginosa; T. longiventris; Nephrotoma polymera; N. incurva.*

On August 26–30, 1922, the following crane-flies were taken in the swampy parts of the woods: *Dicranomyia gladiator; D. pubipennis; D. liberta; D. immodesta; Rhipidia maculata; Gonomyia sulphurella; G. florens; G. subcinerea; Gnophomyia tristissima; Molophilus pubipennis; Ormosia nigripila; O. deviata; O. monticola; Erioptera venusta; E. caloptera; E. armata; Pseudolimnophila luteipennis; P. nigripleura; Limnophila fuscovaria; L. lenta; Pilaria tenuipes; Adelphomyia cayuga; Pedicia albivitta; Tricyphona inconstans; Rhaphidolabina flaveola; Penthoptera albitarsis; Eriocera spinosa; Prionocera fuscipennis; Tipula bella; T. tricolor; T. sayi; Nephrotoma ferruginea; Bittacomorphella jonesi; Bittacomorpha clavipes.*

Molophilus cramptoni sp. n.

General coloration dark brown; antennae of male moderately elongate, if bent backward extending approximately to the wing-root; male hypopygium with the basal dististyle a powerful chitinized rod, on the mesal face before midlength bearing a long slender spine.

Male.—Length about 3.5 mm.; wing, 4.8 mm.

Female.—Length, 4.5–5 mm.; wing, 4.8–5.4 mm.

Rostrum and palpi dark brown. Antennae of moderate length, in the male if bent backward extending approximately to the wing-root; antennae dark brown throughout, the elongate-oval flagellar segments with long white setae. In the female, the antennae are shorter and would not reach the wing-root if bent backwards. Head dark gray.

Mesonotum and pleura dark brown with a very sparse grayish bloom; humeral region of praescutum scarcely brightened. Halteres pale yellow, the knobs more or less infuscated. Legs with the coxae and trochanters obscure brownish yellow; remainder of legs brown, the femoral bases obscure yellow. Wings strongly tinged with brown, the veins and macrotrichiae still darker. Venation: Vein *2nd A* ending near midlength of the petiole of cell M_3.

Abdomen dark brown. Male hypopygium with the basistyles terminating in a blackened, slightly curved spine. Basal dististyle a powerful, entirely chitinized rod, before midlength on the mesal face with a long, slender spine that is a little more than one-third the length of the apex beyond it, the latter dilated before the apex and with the margins delicately and regularly toothed, the teeth becoming smaller toward the apical spine. Outer dististyle with the mesal arm slender and extending a little beyond the broadly dilated lateral blade.

Habitat: New York.

Holotype, ♂, Brookview, Rensselaer County, June 25, 1923 (C. P. Alexander).

Allotopotype, ♀, June 30, 1923.

Paratopotypes, 2 ♂ ♂, 16 ♀ ♀, June 20–30, 1923.

This interesting crane-fly is named in honor of Dr. G. C. Crampton, to whom Dipterologists are indebted for invaluable critical studies on the morphology of the order.

Molophilus quadrispinosus sp. n.

Male.—Length about 3.5 mm.; wing, 4.8 mm.

Generally similar to *M. cramptoni* sp. n., in the elongate antennae and general coloration, differing conspicuously in the structure of the male hypopygium.

Head dark gray. Mesonotum uniformly dark grayish brown, the humeral angles obscure brownish yellow. Pleura dark brown. Legs brown, the femoral bases extensively paler. Wings with a faint brown tinge, the veins and macrotrichiae slightly darker brown. Venation: Petiole of cell M_3 short, about one-fourth longer than the basal deflection of Cu_1; vein *2nd A* ending about opposite midlength of this petiole. Male hypopygium with each basal dististyle a powerful, entirely chitinized black rod that terminates in a powerful, acute outer spine that is about one-half as long as the enlarged base of the style; at the base of this apical spine, a roughened, slightly smaller spine from an enlarged base, directed mesad and slightly caudad; at the base, lying in the axil between this and the outer terminal spine a shorter and more slender, straight spine, directed caudad and slightly mesad; in addition, a fourth small spine on mesal face of the stem of the style near two-thirds its length, making a total of four conspicuous spines borne by this appendage.

Habitat: New York.

Holotype, ♂, Needham's Glen, Ithaca, Tompkins County, June 4, 1911 (C. P. Alexander).

Rhaphidolabis (Plectromyia) confusa sp. n.

Male.—Length about 4–4.5 mm.; wing, 4.8–5.6 mm.

Female.—Length about 5 mm.; wing, 5.6–5.8 mm.

Generally similar to *R.* (*P.*) *modesta* (Osten Sacken), from which it differs as follows:

Lateral praescutal stripes obliterated behind, the median stripe entire. Wings pale brownish subhyaline, the stigma faintly indicated, pale brown. Venation: *Rs* short, gently arcuated; cell R_3 almost always with a conspicuous petiole that is usually equal to or longer than the basal deflection of R_5. Male hypopygium with the details differing from *R. modesta:* Dorsal interbase a flattened blade of nearly uniform diameter, the apex feebly notched; ventral interbase stouter, slightly curved, split at apex into two teeth, one acute, the other obtusely rounded.

In *R.* (*P.*) *modesta,* the dorsal interbase is flattened, the lateral angle a long, slender spine, the mesal lobe a broad, subtruncate blade; ventral interbase a long, slender, gently curved hook, terminating in a long acute tip, some distance back from the apex bearing a small, acute lateral tooth.

Habitat: New York and New England.

Holotype, ♂, Mt. Toby, Franklin County, Massachusetts, altitude 800 feet, May 20, 1923 (C. P. Alexander).

Allotopotype, ♀.

Paratopotypes, 100 ♂ ♀; paratypes, 3 ♂ ♀, Mt. Lake, Fulton County, New York, altitude 1,600 feet, June 13, 1916 (C. P. Alexander); 1 ♂, Helderbergs, Albany County, New York, June 5, 1923 (C. P. Alexander).

The Fulton County paratypes had earlier (Crane-flies of New York, Part I: 815, 1919) been recorded as *R.* (*P.*) *modesta* (Osten Sacken). The fly is common and widely distributed in the Berkshires of Western Massachusetts; it was noted in great numbers along small mountain streams near Charlemont, Franklin County, Massachusetts, in early June, 1923.

Rhaphidolabis (Rhaphidolabis) forceps sp. n.

Belongs to the *tenuipes* group; closest to *R. persimilis* Alexander; mesonotal praescutum with three black stripes; male hypopygium with the ventral face of each basistyle produced ventrad and mesad into a stout, fleshy lobe; ventral interbase a chitinized blade that is profoundly bifid, the arms acute and directed toward one another, forceps-like.

Male.—Length about 5 mm.; wing, 5.5–6 mm.

Female.—Length, 5.5–6 mm.; wing, 7–7.5 mm.

Rostrum and palpi black. Antennae black throughout. Head blackish, pruinose on orbits and in front.

Mesonotal praescutum light gray with three conspicuous blackish stripes, the lateral stripes crossing the suture and covering the scutal lobes; scutellum brownish testaceous; postnotal mediotergite blackened, especially posteriorly. Pleura pruinose, the dorsal portions of the pleuro-tergite paler. Halteres pale, the knobs infuscated. Legs with the coxae infuscated basally, the tips paler; trochanters yellowish testaceous; remainder of legs dark brown, the femoral bases paler. Wings with a faint brownish tinge, the ill-defined stigma darker; veins dark brown. Venation: *Rs* arcuated, in alignment or nearly so with R_5, the basal deflection of which is very short or lacking; petiole of cell R_3 subequal to *r–m*; outer deflection of R_2 close to the tip of R_1; cell M_1 present.

Abdominal tergites dark brown, the sternites and hypopygium paler. Male hypopygium with the median lobe of the tergite very slender. Basistyle with the ventral face produced ventrad and mesad into a stout, conspicuous lobe that terminates in numerous setae; fleshy dististyle shorter than the chitinized dististyle, the latter with the slender apex obtuse. Dorsal interbase a powerful sickle-shaped hook, more oval in shape than in *R. tenuipes,* the apex acute; ventral interbase profoundly bifid, appearing as two slender arms that suggest a pair of ice-tongs, the tips acute, the stem of the interbase with from five to seven setae.

Habitat: New York and New England.

Holotype, ♂, Helderbergs, Albany County, New York, June 5, 1923 (C. P. Alexander).

Allotopotype, ♀.

Paratopotypes, 7 ♂ ♀; paratypes, ♂, Brookview, Rensselaer County, New York, June 16, 1923 (C. P. Alexander); 2 ♂ ♂, Crampton's Camp, near Sunderland, Franklin County, Massachusetts, May 30, 1923 (C. P. Alexander).

The types of the new species described above are preserved in the collection of the writer.

ATRACTOTOMUS MALI (MEYER) FOUND IN NOVA SCOTIA (Heteroptera, Miridae).

By Harry H. Knight, University of Minnesota, St. Paul.

Among the material that the writer has recently received for determination from Dr. H. M. Parshley, are two species of Miridae that prove of special interest from the standpoint of distribution. A species not before recorded from North America is *Atractotomus mali* (Meyer), of which one pair was received bearing the label: Wolfville, Nova Scotia, August 13, 1923 (F. C. Gilliat), predaceous on green apple aphid. As the specific name implies, this species lives chiefly on apple trees, but according to European records it is also frequently found on Crataegus. *Atractotomus mali* has been known to feed on small lepidopterous larvae found on apple trees, but apparently there are no records of it attacking aphids.

The writer has recently recorded in the "**Hemiptera of Connecticut**" (Bul. 34, Conn. State Geol. Nat. Hist. Surv., 1923, p. 461.), *Atractotomus magnicornis* (Fallen) and variety *buenoi* from New York. This latter form may prove to be a good species as certain structural differences and occurrence on hemlock (*Tsuga*) would seem to indicate. *Atractotomus mali* (Meyer) differs from *A. magnicornis* (Fallen) in that the male and female have antennal segment II of approximately equal thickness, while in the male of *A. magnicornis* segment II is sublinear and of equal thickness to segment I, being distinctly more slender than in the female. The character of the pubescence in *A. mali* is also distinctive in that the anterior margin of pronotum and base of vortex is clothed with prominent, suberect, pale yellowish pubescent hairs which curve inward from each side toward the median line, while the lateral margins only of pronotum and embolium bear bristle-like black hairs.

Since *Atractotomus mali* (Meyer) is rather closely associated with apple trees and passes the winter in the egg stage (undoubtedly in twigs of the tree), it is possible that this species has been introduced from Europe in nursery stock.

Pilophorus perplexus D. & S. was recently recognized for the first time from North America, in the "**Hemiptera of Connecticut,**" and recorded from Connecticut and New York. Now two males have been examined bearing the label: Wolfville, Nova Scotia, July, 27, 1923, (F. C. Gilliat), predaceous on the green apple aphid.

A NEW ANKOTHRIPS (THYSANOPTERA) FROM NEW MEXICO.

By J. Douglas Hood, University of Rochester.

In 1909 and 1910 three students of the Thysanoptera, situated in widely separated parts of the world, described almost simultaneously three species of Æolothripidae which were remarkable for certain structural characters previously unknown in the group. Each erected a new genus for the reception of the species known to him; yet, oddly enough, though coming from South Africa, Galicia and California, respectively, these three species were congeneric. *Ankothrips* D. L. Crawford, which has priority, therefore has as its synonyms *Dicranothrips* Trybom and *Prionothrips* Schille.

The new species from New Mexico, described below, is thus the second North American member of the genus. Working with a description only of the exceedingly rare and imperfectly characterized European species (only four specimens are known), it is impossible to delimit the present form as sharply as might be wished; but perhaps the present description will lead to further publication on the subject. The following key to the known species may prove useful.

Genus Ankothrips Crawford.

1. Projection of vertex of head deeply bifid. (South Africa). *A. fissidens* (Trybom)
   Projection of vertex not bifid 2
2. Segment 8 of antennae half as long as segment 7. (Europe). *A. niezabitowskii* (Schille)
   Segment 8 of antennae much more than half as long as segment 7 3
3. Body robust; projection of second antennal segment not bifid; head, pronotum, and mesonotum not closely transversely striate; last two segments of abdomen with all bristles stout; legs shorter and stouter, the middle tibiae three times, and the hind tibiae five times, as long as wide. (California) ....*A. robustus* Crawford
   Body slender; projection of second antennal segment distinctly bifid; head, pronotum, and mesonotum exceedingly finely and closely transversely striate; last two segments of abdomen with bristles slender; legs much longer and slen-

derer, the middle tibiae more than four times, and the hind tibiae nearly seven times, as long as wide. (New Mexico) .... **A. diffractus** Hood

Ankothrips diffractus sp. nov.

Female (macropterous).—Length about 1.3 mm. Color nearly uniform light brown, the last three segments of abdomen darker; tarsi and antennal segments 1–3 paler, segment 1 darkened somewhat at sides, segment 2 darker in basal half and along sides, segment 3 infuscate apically.

Head about 1.1 times as wide as long, broadest just behind eyes, cheeks slightly converging to base; surface exceedingly closely transversely striate; occipital line distinct; projection overhanging insertion of antennae not bifid, bearing the two usual upwardly-directed bristles; frontal costa deeply notched; a pair of prominent interocellar bristles situated close to anterior margins of posterior ocelli; three pairs of prominent postocular bristles, the middle pair shortest. Eyes about as long as their distance from posterior margin of head, three-fourths as wide as their interval. Ocelli nearly equidistant, anterior ocellus directed forward. Antennae 2.5 times as long as head; projection on segment 2 serrate at sides, slightly bifid at tip. Maxillary palpi three-segmented, the segments 24, 21, and 14 microns long, respectively; labial palpi two-segmented, basal segment barely recognizable, distal segment slender, 19 microns long.

Prothorax about 1.75 times as wide as long, shorter than head; pronotum with surface deeply and exceedingly closely transversely striate like head, and with the usual rather prominent bristles on disk and margins, those on posterior margin longer and stouter than the others, except two quite prominent pairs at the posterior angles, midlaterals and those at anterior angles not well developed. Pterothorax wider than prothorax; striae of mesonotum as close as those of pronotum. Wings colorless, those of fore pair about eight times as long as wide, anterior margin with a short fringe beginning just before middle, the hairs becoming gradually longer toward tip of wing; anterior vein with about 27 bristles, posterior vein with about 20. Legs moderately long but quite slender, the middle tibiae more than four times as long as wide, and the hind tibiae nearly seven times as long as wide.

Abdomen slender, bristles on segments 9 and 10 decidedly slender and inconspicuous.

Measurements of holotype: Length 1.27 mm.; head, length 0.140 mm., width 0.156 mm.; prothorax, length 0.128 mm., width (inclusive of coxae) 0.225 mm.; pterothorax, width 0.270 mm.; abdomen, width 0.353 mm.; fore wings, length 0.855 mm.; width at middle 0.110 mm.

Antennal segments	1	2	3	4	5	6	7	8	9
Length (μ)	30	48	60	51	46	45	24	19	23
Width (μ)	35	28	21	18	20	20	16	13	10

Total length of antenna 0.35 mm.

Described from eight females taken by Dr. Alex Wetmore, of the U. S. Biological Survey, at Lake Burford, New Mexico, at an elevation of 7,600 feet, on May 26, 1918. They were not uncommon in the flowers of *Cercocarpus montanus* Raf.

The general facies of this insect is that of a dark colored *Frankliniella,* such as *F. fusca* (Hinds). It is not likely to be confused with its congeners on account of its slender form and the very interesting sculpture of the head, pronotum, and mesonotum.

To Lepidopterists and Coleopterists.

This publication, as every other entomological journal, knows that the greater number of entomologists are students of the Lepidoptera and Coleoptera. We are always willing and anxious to publish a large proportion of papers and notes on these two orders, but we are able to print only what we receive. We especially invite lepidopterists and coleopterists to submit their shorter papers to us, for we can use them. Naturally, we will give preference to North American insects, and publish on other faunas only occasionally, if there is room. We trust that the activity in other orders may be emulated in the two major groups.

J. R. T. B.

SOME ANNECTANT BUGS OF THE SUPERFAMILY CIMICOIDEAE (Heteroptera).

By W. L. McAtee and J. R. Malloch, Washington, D. C.

Those who attempt large things take large risks. This seems to be as true of insect taxonomy as of other affairs. To deal with the major categories of classification before the minor ones are well understood, to say the least, is risky. In the view of the present authors we are now only beginning to realize the vastness of our ignorance of the units of classification, that is species and genera, their enormous number and amazing diversity of structure. So without reflecting at all upon individuals (certain errors being unavoidable in the tasks they undertook), it becomes necessary, from time to time, to point out defects in previous work. This step is inseparable from progress in taxonomy and those who accept their predecessors' findings without verification (merely joining their own contributions to the existing structure) scarcely aid the advancement of science. The only safe building materials in science are verified facts. Assumptions are a prolific source of error and confusion, and their correction or elimination makes more difficult the task of all future workers. With these remarks we plunge into the subjects of this paper.

Miridae: Have been defined as having uniformly three-segmented tarsi. *Peritropis,* an undoubted mirid genus, has (in three species examined) two-segmented tarsi.

Isometopidae: Have been ascribed three-segmented tarsi and two closed cells in the membrane. All we have examined have two-segmented tarsi and a single cell.

Anthocoridae: A genus here assigned to the family because of preponderance of the evidence, has two-segmented instead of three-segmented tarsi as called for by current definition of the family. If the genus be referred to Microphysidae it does still more violence to diagnoses of that group.

Caution inspired by such flaws in past work causes us to refrain from redefining cimicoid groupings. Annectant forms are known and no doubt others will be discovered that will still further emphasize the intermeshing relationships of these bugs. What should be done in the matter of family and superfamily segregations will be clearer when we know much more in detail about the genera and species. Let the field be cultivated diligently.

With the statement that all of the forms treated in this paper and examined by us have seven visible abdominal segments, metathoracic ostioles, and two-segmental tarsi, we present the following key to the groups without giving opinions based on our studies as to their precise systematic standing.

Key to the groups treated in this paper.

1. Beak three-segmented (Fig. 1); closed cell of membrane emitting two free veins (Fig. 2); ocelli present.
Genus *Idiotropus*
Beak four-segmented; no free veins in membrane 2
2. Ocelli present 3
Ocelli absent; membrane with two closed cells
Genus *Peritropis*
3. Membrane with two closed cells; head porrect (Fig. 4).
Genus *Diphleps*
Membrane with one closed cell; head nearly vertical.
Subfamily *Isometopinae*

Genus *Idiotropus*. Fieb.

The genus described below is either an anthocorid with two-segmented tarsi or a microphysid with three-segmented beak, and complete wings and ocelli in the females. Its affinities seem to lie more with the former than with the latter group, between which it is certainly a conecting link. Reuter cites a genus (*Nabidomorpha* Poppius) of microphysid with three-segmented beak, and the discovery of a microphysid with three-segmented or an anthocorid with two-segmented tarsi (which is not at all beyond expectation) will completely bridge the gap between these segregates.

Generic description. Head porrect, much narrowed in front of eyes, ocelli nearer to eyes than to each other; beak quite stout, three-segmented, the basal and second segments long, third short (Fig. 1), ocelli present; antennae 4-segmented, the segments becoming longer in the following order: 1, 3, 2, 4. Tarsi 2-segmented. General form and venation of fore wing as shown in Fig. 2, the membrane having adjacent to corium a single cell with its sides slightly produced as free veins. This cell is difficult to see except by transmitted light at just the right angle. All specimens seen are females and they are all macropterous both as to tegmina and wings. Venation of hind wing as in Fig. 3.

Idiotropus gagates n. sp.

Female.—Glossy black, a rubiginous substratum showing through especially about the coxae; membrane of fore wings paler than the corium. Antennae, legs and genital segment with short pale hairs. Dorsal aspect as in Fig. 2. Head without shagreening. Pronotum microscopically shagreened posteriorly. Scutellum with minute transverse striae, and a poorly defined broad central elevation. Apex of abdomen slightly truncate in side view, the ovipositor extending to base of truncation. Hind tibia about 1.5 as long as femur, distinctly curved; tarsi short and stout, claws simple, of moderate length. Length, 1 mm., including wings, 1.25 mm.

Plummers Id., Md., June 5, 1903, June 6, 1905, June 6, 15, 1908; and Washington, D. C., June 14; Tampico, Mexico, December 26, E. A. Schwarz (U. S. National Museum).

Genus *Peritropis* Uhler.

This genus has been placed in the Miridae, and assigned by Reuter to his subfamily Cylapina and division Fulviaria. The grounds for these dispositions have not been stated, and indeed they could not have been well considered for the genus is an exception to the definition of the family in that the tarsi in the adults are only two-segmented. *Peritropis* together with the genus *Diphleps* treated further on, go far toward bridging the gap between mirid and isometopid forms. The hypopygial claspers of the ♂ *Peritropis* are symmetrical.

We present below a key to the American species, one of which is described as new. As noted by Reuter the genus *Mevius* Distant (Fauna of British India, Rhynchota II, 1904, p. 453) from Ceylon appears to be a synonym of *Peritropis*.

KEY TO THE SPECIES.

1. First segment of antenna extending distinctly beyond tylus, second with a conspicuous pale yellow basal ring; pronotum with a prominent oblong elevation each side of median line; head with a pair of transverse, black-tipped prominences, simulating ocellar tubercles, near hind margin, and a less prominent pair near front margin of eyes as seen from above; membrane fuscous, pale-dotted, remainder of hemelytron testaceous, variegated with fuscous, a large velvety black spot at inner angle of cuneus. **tuberculatus** n. sp.

First segment of antenna not extending beyond tylus; second very inconspicuously pale at base, not banded; pronotum with less distinct, and head without elevations; membrane uniformly pale fuscous 2

2. Pronotum with more prominent elevations, and the hind margin distinctly sinuate, with three centrally grouped lobules and the lateral portions of hind margin pale; corium fuscous with faint pale dots, especially along the costa. *saldaeformis* Uhler

Pronotum with inconspicuous median elevation, the hind margin entire; corium black, copiously dotted with gray. *husseyi* Knight

Peritropis tuberculatus n. sp.

To the characters mentioned in key we would add the following: Beak long, overlapping genital cleft of female; second segment of antenna somewhat longer than all the others combined, with 2 pale annuli, one at base, and the other less than half length of segment from base; the first segment is pale, variegated with reddish; the last two are more slender and more hairy than the others. General color of insect testaceous, variegated with fuscous, and tinged here and there with reddish; squarish fuscous markings on costa regularly arranged; venter and legs pale reddish brown, the tibiae with pale annuli, and connexivum with pale blotches. Length: 2.8 mm.

Holotype ♀, Cacao, Trece Aguas, Alta Vera Paz, Guatemala, April 15; allotype ♂, Livingston, Guatemala, May 4, E. A. Schwarz and H. S. Barber. The general coloration of the male somewhat lighter than described for the female but the specimen may not be fully mature. A badly crushed ♀ specimen from the same locality as the holotype, April 5, also has been examined.

The material of *P. saldaeformis* Uhler studied by us has the following data: Bladensburg, Md., July 28, 1890, found on dry branch of tree, a female, which for the reasons that it is in fair condition, has the fullest data, and is one of the specimens most specifically mentioned in connection with the original condition, is chosen as lectotype; a nymph with same data (Uhler informs us these specimens were collected by Otto Heidemann); Illinois, 1 ♂, 1 ♀; Columbus, Texas, June 13; San Diego, Tex., April 18, May 4, E. A. Schwarz. All of the forementioned specimens of *Peritropis* are in the U. S. National Museum.

Of *P. husseyi* Knight, we have examined a paratype female from Washtenaw County, Michigan, August 11, 1920, under bark, R. F. Hussey, kindly loaned by Dr. Knight.

Bibliographical references to the original descriptions are: *P. saldaeformis* Uhler, P. R., Proc. Ent. Soc. Wash., 2 (1890), 1891, pp. 122–123 [" region of Washington," Ill.]; and *P. husseyi* Knight, H. H., Ent. News, 34, No. 2, Feb., 1923, pp. 50–52 [Mich., Ala.].

Genus *Diphleps* Bergroth.[1]

Diphleps Bergroth, E. Notulae Entomologicae, 4, No. 1, March, 1924, pp. 5–7. [Monobasic, genotype *D. unica,* n. sp. Ohio.]

> Broad and depressed, the head and thorax (in mounted specimens), and the hemelytra posterior to cuneal fracture, inclined decidedly downward from the plane of corium and scutellum. Head porrect (in plan) deeply inset in anterior part of pronotum (see Fig. 4); ocelli situated at about their own diameters from inner margins of eyes; near hind margin of head; antennae inserted in front of eyes; pronotum depressed within the explanate margins, slightly longitudinally carinate in the middle, the low carina flanked by two oval calloused spots on each side, forming a transverse row across disk; suture between basal and apical moieties of scutellum conspicuous, the former division with a transverse ridge, the latter with a low median carina apically; ostiole present laterad of space between mid and hind coxae. Costa broadly explanate, clavus wider apically than basally; cuneus extending to apex of tegmen; cells of membrane extending almost to apex; venation of hind wing as in Fig. 5. Beak attaining base of abdomen. Femora swollen, especially those of the hind legs which appear fitted for jumping (Fig. 6); hind tibia with microscopic serration. Genital cleft of female dividing all except the two basal segments of venter (Fig. 7).

This genus resembles *Peritropis,* so much so that the presence of ocelli loses its impressiveness as a primary character segregating mirid from non-mirid forms. In general build (including the larger group characters), in the structure of antenna, form of thorax, even the texture of chitin and general color scheme the two genera are much alike.

---

[1] We have substituted this name from a paper reaching us after our MS. was submitted for publication, without otherwise altering the text. We have known the genus for four years and we believe that the genus *Teratodia* Bergroth described in the same article (Monobasic, genotype, *T. emoritura* n. sp., Va., pp. 7–8) is based on the male of *Diphleps.*

Diphleps unica Bergroth.

> General color gray, marbled with fuscous and sparsely marked with black; basal and apical two segments of antenna, and broad annulus on middle of second, black; eyes dark reddish; two spots near inner margins of eyes and apex of tylus fuscous, ocelli and some spots on anterior part of vertex red; mesonotum largely fuscous, apex of scutellum black; a few dashes along costal vein, regularly spaced maculae on costa, and conspicuous dot on inner margin of cuneus blackish or black; membrane closely dotted with pale fuscous; underside rather livid, without distinct markings. Dorsum of head, thorax and coriaceous parts of forewings with regular, decumbent pale scales. Length: 2 mm.

Five females and two nymphs, Urbana, Ill., August 13, 1920, on bark of hackberry; one female Glen Echo, Md., July 17, 1921, on oak, J. R. Malloch. In the case of both these collections there was a growth of lichens on the bark from which the specimens were collected, and the bug may be associated with these plants.

Subfamily *Isometopinae*.

All of the material representing this group studied by us belongs to the U. S. National Museum.

KEY TO THE GENERA.

1. Base of scutellum (*i.e.* mesoscutum, exposed by double emargination of the pronotum) with ridges, one on each side, which arise at the anterior angles and run obliquely across, their inner extremities, however, not meeting 2

   Base of scutellum without such ridges (or not so exposed as to show them) 3

2. Head about half as wide as posterior border of pronotum, its lower outline (viewed from the front) rounded, antennal insertions nearer to eyes than to beak; clavus wide posteriorly, much surpassing the almost equilateral, moderately pointed scutellum; eyes almost contiguous in front of ocelli .... *Heidemannia* Uhler

Head more than half as wide as pronotum, the cheeks lobate below eyes, antennal insertions nearer to beak than to eyes; clavus narrowed posteriorly, but little surpassing the distinctly isosceles and acuminate scutellum; ocelli as well as the eyes widely separated ....*Isometopus* Fieb.

3. Second segment of antenna laminately dilated, wider than length of head; eyes very large and rather close together, the ocelli practically contiguous 4

Second segment of antenna not laminately dilated though it may be thickened 5

4. Second segment of antenna about four times as long as first, gradually widened from base; first segment much shorter than width of head, globose, without spurs *Sophianus* Distant

Second segment of antennae scarcely three times as long as first, deeply scooped out, husk-like, the convex anterior side and the margins with many long pale hairs; first segment as long as width of head, thick, with a stout spur above and another below (Fig. 16) ......**Alcecoris** n. g.

5. Pronotum with the lateral carina obsolete anteriorly but distinct and sharp posteriorly 6

Pronotum with a sharp carina from anterior to posterior margin 7

6. Pronotum without transverse impression; scutellum in general moderately inflated, the apex rounded, prominent; front not produced downwardly ....*Lidopus* Gibson

Pronotum with a deep transverse impression just in front of hind margin; scutellum with a conspicuous semi-globular elevation posteriorly; front produced downwardly past base of beak (Fig. 14) ....**Wetmorea** n. g.

7. Head higher than wide, only about half as wide as hind margin of pronotum; apical segment of antenna ovoid, much shorter than subapical segment .... *Myiomma* Puton

Head wider than high, more than half as wide as hind margin of pronotum; apical and subapical segments of antenna similar in form and length. *Corticoris* McAtee and Malloch

Isometopus Fieb

Isometopus Fieber, F. X. Wien. Ent. Monatschr., 4, No. 9, Sept., 1860, p. 259, pl. vi, a. [Two species included: *Acanthia intrusa* H. S., and *I. alienus* n. sp., of which the former was named as type by Distant, Fauna British India, Rhynchota, II, 1904, p. 484].

Genus *Isometopus* Fieb.

Cephalocoris Stein, J. P. C. F. Berlin. Ent. Zeitschr., 4, 1860, p. 79 [Monobasic, *Acanthia intrusa* H. S., Genotype. Europe]. This name published in the first installment of the Zeitschrift (apparently published in two parts (this year certainly)) antedates *Isometopus* Fieber published in September of the same year. It is, however, preoccupied by Heer's genus of the same name (1853) so that *Isometopus* must be used.

Turnebus Distant, W. L. The Fauna of British India. Rhynchota, II, 1904, p. 485, fig. 318. [Monobasic, *T. cuneatus* new species, Ceylon.] So far as we can judge from the description and figure of *Turnebus* it does not deserve to be separated from *Cephalocoris.*

Genus *Myiomma* Puton.

Myiomma Puton, A. Pétites Nouvelles Entomologiques, 4, No. 44, Jan. 15, 1872, p. 177. [Monobasic, genotype, *M. fieberi,* new species, France.] A figure is published in Ann. Soc. Ent. France, 5e ser., 3, 1873, pl. 1, fig. 3, from which we draw the characters used in our key.

Genus *Heidemannia* Uhler.

Heidemannia Uhler, P. R. Proc. Ent. Soc. Wash., 2, No. 1, 1890 (1891), pp. 119–121, Fig. 7. [Monobasic, genotpye, *H. cixiiformis* new species, Maryland, Virginia.] We are unable to concur in synonymizing this genus with *Myiomma* Puton. Its almost holoptic condition is sufficient to distinguish it from the latter genus, even if the character used in our key (and applied to *Myiomma* on the basis of a figure only) should prove illusory. We are not unmindful of what Reuter said on this subject (Hemip. Miscel., 1912, pp. 27–28) but think we can rely on the figure prepared by Puton for the foregoing conclusions. That figure represents a ♂ which has the ocular structure generically distinct from *Heidemannia*; certainly the ♀ from which the genus was described would not have larger eyes than the male; *Heidemannia* is nearly holoptic in both sexes.

A locality record not previously published is Jackson's Id., Md., July 3, 1911, P. R. Myers. A note giving, more definitely than has previously been done, the habitat of this insect may not be out of order. McAtee collected two specimens, the present location of which is unknown, at Plummers Island, Md., in shady woods, on barkless surface of a hackberry limb or bole about 3 to 4 inches in thickness. Most of the surface of this wood was covered by a thin velvet-like growth of fungus, with which the insects may have been associated.

Head of *cixiiformis* from above as in Fig. 8, tarsal claws as in figure 9. Venation of hind wings differs from that of *Corticola* (Fig. 5) in the anterior apical vein emitted from discal cell bending forward and entering the costal margin about midway to apex of wing, and the discal cell being much narrower at apex.

Sophianus Distant, W. L. The Fauna of British India, Rhynchota, II, 1904, pp. 485–486, Fig. 319. [Monobasic, genotype, *S. alces* new species, Ceylon.]

Genus *Sophianus* Distant.

Lidopus

Lidopus Gibson, E. H. Bul. Brooklyn Ent. Soc., 12, No. 4, Oct., 1917, p. 74. [Monobasic, genotype, *L. heidemanni* new species, Texas.]

KEY TO THE SPECIES.

Second segment of antenna twice as long as third and fourth together; thickness of head about one-third its height; pronotum with numerous coarse, non-setigerous punctures; pronotum black, head and tegmen fuscous; tip of scutellum ivory; anterior half of cuneus white (Texas). *heidemanni* Gibson

Second segment of antenna distinctly less than twice as long as third and fourth together; thickness of head about one-half its height; pronotum with fewer, and finer, setigerous punctures. Color pattern about the same as in *heidemanni*. Length, 2 mm. ♀ Cacao Trece Aguas, Guatemala, April 20, E. A. Schwarz and H. S. Barber. **schwarzi** n. sp.

Genus *Corticoris* McAtee and Malloch.

Corticoris McAtee, W. L., and Malloch, J. R. Proc. Biol. Soc. Wash., 35, p. 95, Aug. 30, 1922. [New name for *Isometopus* of

American authors not of Fieber, orthotype, *I. pulchellus* Heidemann.]

Dendroscirtus Bergroth, E. Notulae Entomologicae, 4, No. 1, March, 1924, p. 4. A substitute for *Corticoris* McAtee and Malloch condemned as a hybrid name. No code of nomenclature recognizes such name tinkering. A name is a name, otherwise what becomes of all the generic names adapted from the barbarous languages, including such personal dedications as Bergrothia, Rothbergia and the like?

A key to the species is given below but the only further annotations are a few locality records heertofore unpublished. All of the species except *Myiomma media* Gibson were described from female specimens exclusively; the material for *media* was a single male collected at the same time and place as the females of *unicolor* Heidemann. We have found a specimen bearing the same relation to *pulchellus* that *media* does to *unicolor,* and we believe we are safe in associating these as the males of the two species respectively. The males have more ample tegmina and wings than the females making their size as indicated by measured length greater than that of the females which, however, they do not exceed in bulk of body; the characters used to identify them in the key result from the greater development of eyes and ocelli, a common characteristic of male insects.

Fore wing as in figure 10; abdomen of ♀ as in figure 11.

KEY TO SPECIES.

1. Eyes relatively smaller, their lower margins not forming arcuations in lower outline of head as viewed from in front; space between lower margin of eye and upper border of antennal socket wider than thickest part of second antennal segment. Females 2

Eyes relatively larger, their lower margins forming distinct arcuations in lower outline of head as viewed from in front; space between lower margin of eye and upper border of antennal socket much narrower than thickest part of second antennal segment. Males 5

2. Face decidedly gibbous below, outline of head viewed from in front more rounded triangular (almost elliptical); space between lower margin of eye and antennal socket entirely black 3

Face less gibbous below, outline of head viewed from in front more angularly triangular; space between lower margin of eye and antennal socket bicolored, whitish posteriorly, dark anteriorly 4

3. Narrowest part of space between eyes wider than one eye; facial convexity not evenly rounded as seen from above, having a shallow depression on each side near eye; pronotum (except posterior angles) and scutellum piceous; base and apex of clavus, and oblique marking across corium and cuneus fuscous, margin of head, antennae, and legs chiefly pale (*Isometopus signatus* Heid.)
♀ *signatus* Heidemann.

Narrowest part of space between eyes distinctly narrower than one eye (Fig. 12); facial convexity evenly rounded from eye to eye as seen from above; hemelytron except basal half and extreme apex of clavus, and dot at inner angle of cuneus, whitish to cream color; scutellum, thorax, and head piceous; beak, legs, and antennae chiefly pale.
(*Isometopus pulchellus* Heid.) ♀ *pulchellus* Heidemann.

Pronotum and scutellum piceous, hemelytra fuscous; margin of head, a streak on upper surface and the apex of second antennal segment and apices of femora and tibiae pale. (Ariz.) (*Isometopus unicolor* Heid.) .
♀ *unicolor* Heidemann.

Pronotum black on anterior, yellowish on posterior half; hemelytron yellowish, with a faint brown mark on middle of clavus, and a large dark brown mark extending obliquely from middle of corium backward to its apex, but which does not reach the inner margin until beyond apex of scutellum, and falls short of cuneus; the apex of latter dark brown, membrane fuscous hyaline (*Isometopus liberatus* Gibs. N. Mex., may be only a color variety of *unicolor*) .... ♀ *libertus* Gibson.

5. Ocelli conspicuous; when seen from in front the ocellar elevations are separated by not more than the width of one of them (Fig. 13); scutellum, adjacent parts of clavus, and parts anterior fuscous, hemelytra yellowish brown, cuneus and inner angle of corium infuscated (Ariz., *Myiomma media* Gibson) .... ♂ *unicolor* Heidemann.

Ocelli smaller; when seen from in front the ocellar elevations are separated by about twice the width of one of them (Fig. 12); hemelytra whitish hyaline the cuneus infuscated .... ♂ *pulchellus* Heidemann.

I. pulchellus Heidemann.—Plummers Id., Md., May 29, 1914, at light, R. C. Shannon; Bedford County, Pa., Aug. 24.

I. signatus Heidemann.—Victoria, Tex., April 4; Goliad, Tex., April 18, 19, E. A. Schwarz; Beeville, Tex., April 22; Washington, D. C., July 29 (Uhler collection).

Genus **Wetmorea** n. gen.

It should be noted that the characters mentioned in the key are not repeated here. In order to place the genus in the key an assumption was made as to the nature of antenna. They are lost in the single specimen examined which is otherwise damaged, but which nevertheless shows sufficiently the characters of a highly distinct new genus. Head viewed from in front longer than wide, the front projecting downward as a broadly rounded lobe entirely concealing clypeus and beak from this view (Fig. 14–15). From the side, therefore, one can see a posteriorly facing surface of the front, a very rare thing indeed in insects. The antennal insertions adjoin lower margins of eyes. Eyes well separated, frons with a shallow median groove between them, ocelli near inner margins of eyes, which are emarginate just behind them. Pronotum inflated in front above level of vertex, the sides flaring abruptly behind transverse impression, the hind margin broadly and deeply emarginate, exposing ample base of scutellum; the scutellum proper margined all around, the apex rounded. Beak somewhat overlapping genital segments.

Named for Dr. Alexander Wetmore, the collector. Genotype, the following species.

Wetmorea notabilis n. sp.

General color fuscous, the posterior margin of pronotum narrowly pale, and polished spot posterior to inner angle of cuneus white. Frons with some long, and margins of head behind eyes, with short dark bristles. Length, 2 mm. Holotype, ♀ Dragoon Mts., Ariz. (Cochise Stronghold, 5,000 ft.), July 16, 1919, Alexander Wetmore.

Genus **Alcecoris** n. gen.

Head a fourth longer than wide as viewed from in front (Fig. 16); the extraordinary antennae described in key furnish the principal generic characters, no 3rd and 4th segments are present in the single specimen at hand so their structure is unknown; the great size of the antenna apparently has required special developed of supporting structures, the front is bounded on each side by ridges converging at almost right angles at bases of antennae and there is a well developed pointed tubercle behind each antennal insertion just below eye.

Fully one-third the height of head stands clear above juncture with pronotum, the latter with well developed collum and complete lateral carinae which are somewhat explanate at posterior angles. Pronotum and basal part of scutellum conjointly inflated, posterior part of scutellum moderately sloping, with a subapical polished knob, and a carinate margin which is slightly raised apically. Beak short, not surpassing the rather elongate front coxae. Second sternite of abdomen longer than next three combined. Genotype, the following species.

Alcecoris periscopus n. sp.

Head, antennae and pronotum fuscous, the eyes reddish brown with dark blotches. Posterior moiety of scutellum orange brown, the subapical callosity white; clavus and corium with numerous punctures bearing rather long dark hairs; a dusky blotch on corium above middle of clavus, another near apex on costa, and a larger orange-brown spot near inner angle; cuneus black, with a larger and a smaller white spot; membrane blackish. Length, 2.5 mm.; the first and second antennal segments together 1.5 mm. ♀ Timor, on orange tree, Geo. Compere.

BIBLIOGRAPHY.

Following are a few citations that may be useful to students of Isometopinae.

Distant, W. L,

The Fauna of British India. Rhynchota.

In Vol. II, 1904, p. 480 is described the genus *Bilia* (monobasic, genotype *B. fracta* n. sp., Ceylon) which looks like an Isometopid, but nothing is said of ocelli.

In Vol. V, 1910, pp. 293–294, is described the genus *Jehania* (monobasic, genotype *J. mahal* n. sp., India.)

Rhynchota Malayana, Part III.

Records of the Indian Museum, 5, 1910, p. 315.

Skapana new genus, monobasic, genotype, *S. typica* n. sp. Borneo.

Kirkaldy, G. W.

Memoir on a few heteropterous Hemiptera from Eastern Australia.

Proc. Linn. Soc. New South Wales, 32, 1907, p. 784.

Eurocrypha new genus, monobasic, genotype, *E. thanatochlamys* n. sp., Australia.

A catalogue of the Hemiptera of Fiji.

Proc. Linn. Soc. New South Wales, 33, Pt. 2, August, 1908, pp. 375–376.

Nesocrypha corticicola new genus and species described.

Poppius, B.

Sur Kenntnis der Miriden, Isometopiden, Anthocoriden, Nabiden und Schizopteriden Ceylon's.

Ent. Tidskrift, 34, 1913, pp. 251–3.

Isometopidae lieweni new genus and species described.

H. Sauter's Formosa-Ausbeute; Nabidae, Anthocoridae, Termatophylidae, Miridae, Isometopidae und Ceratocombidae (Hemiptera).

Arch. f. Naturgesch., 80, Abt. A, H. 8, March, 1915, pp. 75–
Turnebiella pallipes new genus and species described, and
76.

Paloniella new genus proposed for *Isometopus feanus* Distant.

EXPLANATION OF PLATE.

Fig. 1. *Idiotropus gagates,* beak.

Fig. 2. *Idiotropus gagates,* entire insect from above.

Fig. 3. *Idiotropus gagates,* hind wing.

Fig. 4. *Diphleps unica,* entire insect from above.

Fig. 5. *Diphleps unica,* hind wing.

Fig. 6. *Diphleps unica,* hind leg.

Fig. 7. *Diphleps unica,* abdomen of ♀ ventral view.

Fig. 8. and 8a. *Heidemannia cixiiformis,* head from side and from above.

Fig. 9. *Heidemannia cixiiformis,* hind tarsal claws.

Fig. 10. *Corticoris unicolor,* fore wing.

Fig. 11. *Corticoris pulchellus,* apex of abdomen of ♀ from below.

Fig. 12. *Corticoris pulchellus,* head of ♀ from above.

Fig. 13. *Corticoris unicolor,* head of ♂ from above.

Fig. 14. *Wetmorea notabilis,* head and thorax from side.

Fig. 15. *Wetmorea notabilis,* head from in front.

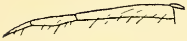
Fig. 16. *Alcecoris periscopus,* head and antennae from in front.

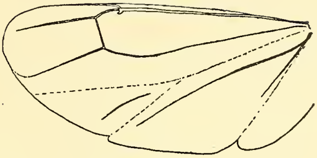
Fig. 17. *Alcecoris periscopus,* second antennal segment from behind.

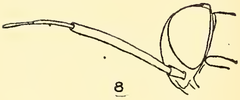
Fig. 18. *Microphysa tenella,* fore wing.

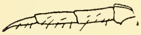
Fig. 19. *Microphysa tenella,* beak.

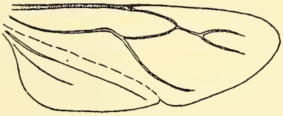
Fig. 20. *Microphysa tenella,* hind leg.

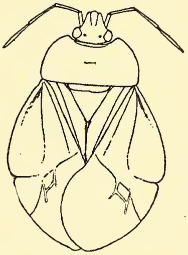

1

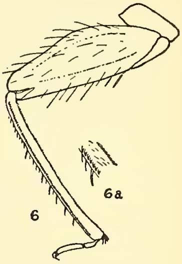

5

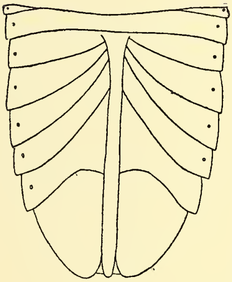

8

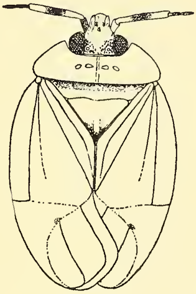

19

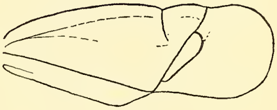

3

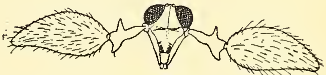

2

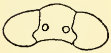

6 6a

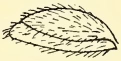

7

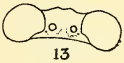

4

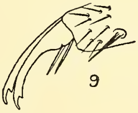

10

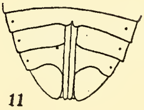

16

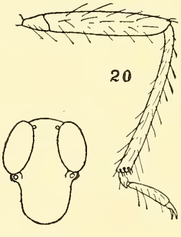

12

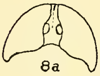

17

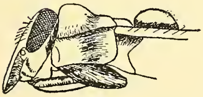

13

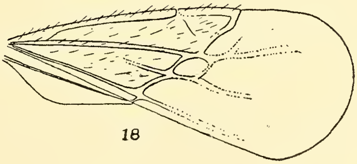

9


11


20 15


8a


14


18

THE PARSLEY WEEVIL (LISTRONOTUS LATIUSCULUS BOH.), A POTENTIAL PEST.

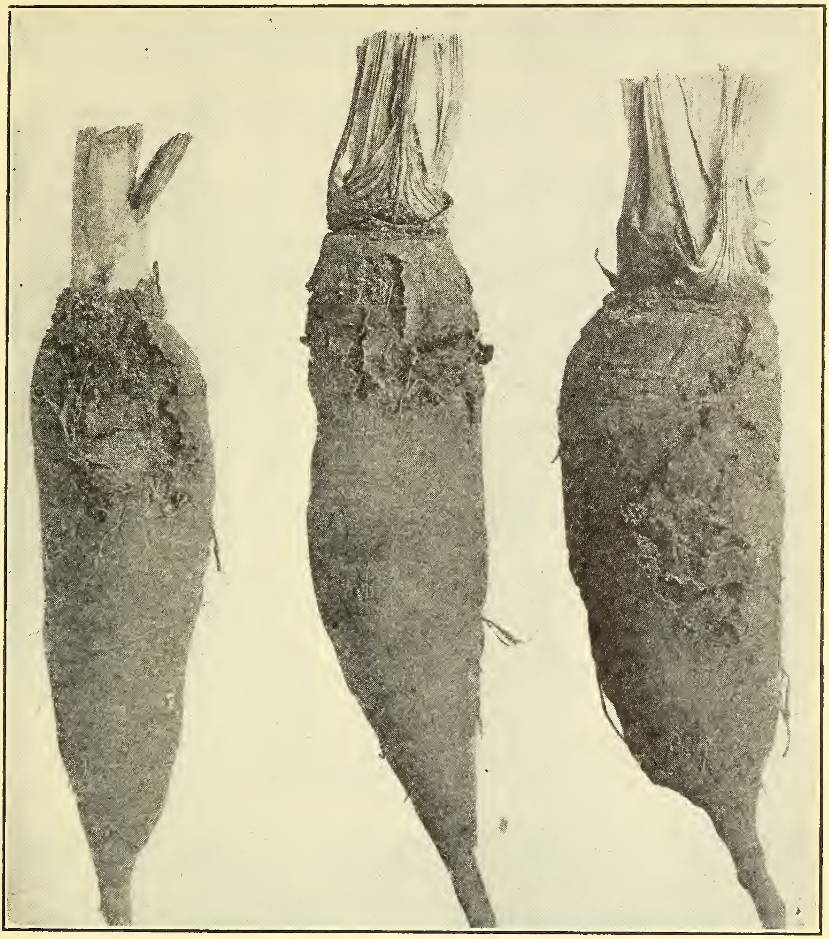
By F. H. Chittenden, U. S. Department of Agriculture,
Washington, D. C.

On July 9, 1923, Prof. C. R. Crosby, Cornell University, sent carrots collected in Valley Stream, Nassau County, N. Y., containing larvae of what proved by rearing to be this species. Later specimens of carrots were received from Mineola, Long Island, containing the larvae, which also were subsequently reared.

July 18, 1923, Mr. Frank Memmella, Astoria, Long Island, N. Y., furnished larvae of the same species with report that 50 per cent. of his carrot crop had been lost the previous year because of this pest and that the same trouble was again present. Specimens of these also were reared to adult. Our correspondent had a field which was well manured and another field which had not been manured for two years, fertilizer being used instead and broadcasted before sowing. Both fields suffered the same percentage of infestation. Some of the larvae from this latter lot developed as early in our rearing jars as July 28, the last one entering the earth August 6 and pupating about August 8.

In 1916 this species was so abundant on parsley grown in our experimental garden attached to the Department of Agriculture that it attracted considerable attention. As usual, the presence of the insect first became manifest from the injury to the roots when pulled from the earth. Beetles were also abundant. The soil was dry rather than moist. Nothing more was heard of this species in subsequent years until September 16, 1922, when Mr. Herbert S. Barber observed larvae that were injuring carrots in his backyard garden at Washington, D. C., which he stated was not moist and not even near any stream or damp location. The same year, the work of this species was located in the grounds of the Department of Agriculture. Of the occurrence at Astoria, L. I., our correspondent wrote on September 9 that the area where his carrots were grown was about three fourths of a mile from swamp land.

Attack is principally to the upper part of the head of carrots but in small ones may extend well down to the roots. Small ones also are apt to be stunted and entirely injured for any purpose except for food for hogs. In the case of larger roots, larvae



Carrots from Long Island, showing injury by *Listronotus latiusculus*

sometimes bore down to a depth of a full inch, sometimes toward the center, although, as a general rule, attack is around the outer surface. Practically all carrots that are attacked by this species are ruined for market.

Only one larva has ever been noticed in a single carrot but it is quite possible that two or three might occasionally be found in the case of unusual abundance of the weevil.

It should be recorded that Mr. W. P. Flint, State Natural History Survey Division, Urbana, Ill., sent larvae of what are with very little doubt the same species, with report of injury to carrots September 1, 1923.

In regard to the technical name of the species, there continues to be considerable doubt, the status of the genus being somewhat chaotic.

Since the publication of the writer's account,[1] it would naturally appear that the original supposition that this species was semiaquatic and that the attack to cultivated plants was accidental rather than otherwise should be modified. It is evident that we now have to deal with a species which is liable to be injurious to carrots or parsley at almost any time and place in its rather wide distribution.

Microbracon sp.—A single example of this parasite was found in a rearing cage with the host and Mr. S. A. Rohwer states that it is quite likely a parasite of the parsley stalk-weevil.

In regard to methods of control, the only one that seems feasible is crop rotation. It is evident from what has been said that the species should be more carefully studied from the systematic standpoint and also as regards its full life history. There would naturally be some slight doubt as to whether the species reared by Dr. C. M. Weed in Ohio from *Sagittaria* is the same as the one under discussion.

A New Locality for Pamphila meskei Edwards.—Mr. William T. Davis, of New Brighton, Staten Island, N. Y., has kindly given to me several specimens of *Hesperiidae* collected by him at Southern Pines, North Carolina, among them being a male specimen of *Pamphila meskei* Edwards taken on June 14, 1920. This species seems to be rare in collections, and the only records of its occurrence known to me are from Florida and Texas. The capture of this specimen in North Carolina is of considerable interest and extends the known range of the species much further north along the Atlantic Coast.—E. L. Bell, Flushing, N. Y.

---

[1] Bul. 82, Bur. Ent., U. S. Dept. Agr., Part II, pp. 14–19.

TWO NEW SPECIES OF CYMUS
(Hemiptera-Lygaeidae).

By H. G. Barber, Roselle, N. J.

Cymus robustus n. sp.

Very closely related to *Cymus luridus* Stål but more robust with different coloration. The dorsal and ventral parts, antennae and legs are of a fairly uniform rufescent-brown, varying to ochraceous-brown; head beneath and sternum often infuscated; apex of terminal segment of antenna and extreme apex of corium fuscous. Membrane hyaline, not longitudinally streaked in the middle but sometimes faintly mottled with fuscous.

The head is relatively broader than in *luridus,* being nearly one-third wider than long and more inclined; apex of tylus very nearly reaching to apex of basal antennal segment. The antennae are considerably shorter than in *luridus,* with all of the segments except the basal one obviously shorter and appearing less slender, second and third segments subequal. The pronotum is about one-third wider than long, relatively wider than in *luridus* in which it is about one-fifth wider than long; lateral margin with its anterior one-third somewhat expanded and crenulated, the anterior angles projected on a line with the eyes and abruptly contracted before; closely and coarsely punctate all over even along the broadly depressed anterior margin; the longitudinal median carina very short and not so evident as in *luridus*; usually not extended to the anterior margin; evanescent before middle of disk; cicatrices represented by two somewhat orbicular, transverse areas. Longitudinal carina of the scutellum quite evident. The hemielytra are more broadly oval than in *luridus,* with the outline of the costal margin a little more strongly arcuated; the clavus and corium a little more strongly punctate; clavus with about four irregular rows of punctures towards apex. Membrane subhyaline without a median longitudinal streak but often faintly mottled with fuscous; relatively shorter than in *luridus,* one-third longer than its greatest width at apex of corium. Tip of abdomen extended but slightly beyond apex of corium.

Male 4.5 mm. long; width across corium 1.65 mm.

Female 4.7 mm. long; width across corium 1.87 mm.

Type: Male, Mt. Kisco, N. Y., VII, 23, 1923; allotype: taken with the type; paratypes: 12 males, Mt. Kisco, N. Y., VII, 23, 1923; 2 males, Carmel, Putnam Co., N. Y., VII, 11, 1923; 15

females, Mt. Kisco, N. Y., VII, 23, 1923; 15 females, Carmel, Putnam Co., N. Y., VII, 11, 1923; 1 female from each of the following localities: Cold Spring Harbor, Long Island, VII, 31, 1920; Michigan; Stony Point, N. Y., VII, 27, 1910 (W. T. Davis).

This species was discovered by Mr. J. R. de la Torre-Bueno, feeding in flower and seed heads of a tall species of bulrush (Juncus). Most of the paratypes are in the collection of Mr. Bueno. Type, allotype and paratypes in my collection. The specimens from Carmel, N. Y., are less rufo-fuscous, varying more to testaceous or ochraceous-brown.

Cymus reductus n. sp.

Closely related to *C. angustatus* Stål and *C. guatemalanus* Dist. Color pale grayish-yellow, with the head above and below, basal segment of antennae, pronotum at least anteriorly, sternum for the most part and often the venter, apical third of scutellum and femora pale ferrugineous; tibiae, tarsi and sometimes the venter paler than the sternum; apical segment of antenna, a small spot at the apex of the commissure and at apex of the corium, fuscous. Head in part, pronotum transversely just behind the depressed anterior margin, scutellum except at apex and the pleurae in part, whitish-pruinose.

Head one-third wider than long, tylus well extended beyond apices of jugae, not quite reaching the apex of the very incrassate basal segment of antennae. Second segment of the antenna over one-third shorter than the third and a trifle shorter than fourth, which is spindle formed, not quite as much swollen as the basal segment. Rostrum with the third segment shorter than either the second or third. Pronotum one-fourth wider than long, closely punctate with ferrugineous; broadly depressed anteriorly; lateral margins not impressed; median longitudinal carina very slightly elevated sometimes quite faint. Scutellum pruinose, with an oval ferrugineous spot at apex. Corium and clavus grayish-yellow, very evenly and closely punctate; a small fuscous spot at apices of the commissure and corium; corium as compared with *angustatus,* scarcely contracted at base, nearly as wide there as across the middle, costal edge very slightly arcuate, apex reaching to just beyond the posterior margin of fifth abdominal segment. Membrane hyaline.

Length male, 3.3 mm.; female, 3.8 mm.

Type: Male and allotype, Huachuca Mts., Ariz., VII, 1905; paratypes: 5 males and 14 females taken with the type; male and female Tepehuanes, Durango, Mexico (Coll. by Prof. Wickham).

This species is smaller than *angustatus* with the tylus not so much extended; third segment of the rostrum relatively shorter; corium less contracted at base and more inclined to be parallel sided and not extended quite so far along the abdomen. This is probably what Van Duzee has recorded from Arizona as *C. guatemalanus* Dist.

KEY TO SPECIES OF CYMUS.

1. Basal segment of the antenna well extended beyond apex of tylus, half or more than half the length of second .... 2.

   Basal segment of the antenna sometimes extended to, but scarcely exceeding, apex of tylus, less than half the length of second .... 3.

2. Basal segment of antenna more slender, at least three times as long as wide, extended for more than one-half its length beyond apex of tylus, concolorous. Lateral margins quite evidently impressed anteriorly. Length 4–4.25 mm. (Md., So. E. States, Mo., West Indies.) (= breviceps Stål = exiguum Horváth) .... *virescens* Fab.[1]

   Basal segment of antenna short and stout, twice as long as wide, extended for about one-half its length beyond apex of tylus, black, pale at apex. Lateral margin of pronotum not impressed. Length 3 mm. (Florida). *bellus* Van Duzee.

3. Second segment of the antenna at least one-third shorter than third segment. Lateral margin of pronotum not impressed. Median longitudinal carina most commonly inconspicuous .... 4.

   Second segment of the antenna very nearly equal to the third. Lateral margin of the pronotum quite evidently impressed or carinate. Median longitudinal carina sometimes short but quite evidently elevated .... 5.

4. Tylus plainly well extended beyond apex of the basal antennal segment. Third segment of the rostrum not shorter than the second or fourth. Corium quite evidently contracted at base, with the costal margin more arcuate. Length, 4–4.5 mm. (U. S. east of the Rocky Mts.). *angustatus* Stål.

---

[1] Barber, H. G., Amer. Mus. Novitates, No. 75, p. 12, 1923.

Tylus very slightly extended beyond apex of basal antennal segment. Third segment of rostrum shorter than either second or fourth. Corium obsoletely or not at all contracted at base; costal margin more nearly parallel. Length, 3.3–3.8 mm. (Ariz.) .... **reductus** n. sp.

5. Second segment of antenna a very little longer than third, the latter subequal to fourth. Tylus not so strongly projected beyond apices of jugae. Small species, 3.5 mm. (Nova Scotia to Pa. and west to Mich.) ...... *discors* Horváth.

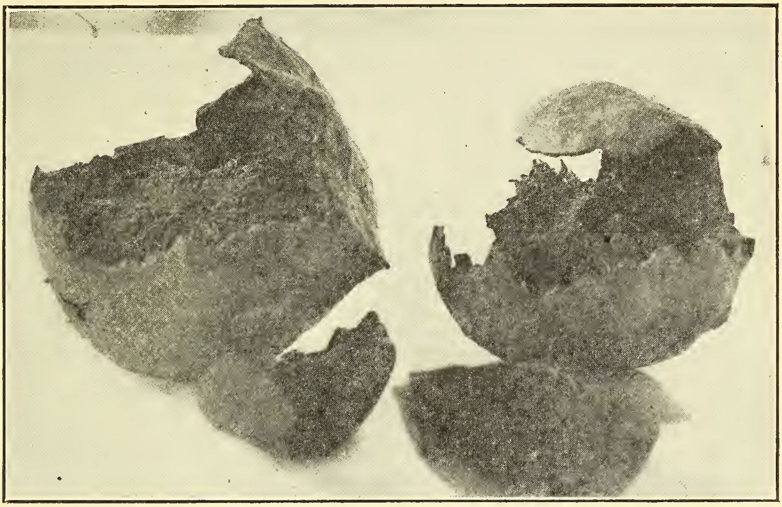
Second segment of antenna subequal to third, the latter plainly longer than fourth. Tylus more strongly projected beyond apices of jugae. Larger species, over 4.5 mm. ....6.

6. Form more slender. Head and pronotum each about one-fifth wider than long. Pronotum more finely punctate; median longitudinal carina quite evident from anterior margin to beyond middle of disk. (Canada and northern U. S.) .... *luridus* Stål.

Form more robust. Head and pronotum each one-third wider than long. Pronotum more coarsely punctate; median longitudinal carina short, commonly not reaching middle of disk. (N. Y., Mich.) .... **robustus** n. sp.

OAK APPLE GALLS DESTROYED BY GRAY SQUIRRELS.

By Wm. T. Davis, Staten Island, N. Y.



In the Canadian Entomologist for January, 1907, the writer called attention to the considerable number of acorn weevil larvae (*Balaninus*) destroyed by squirrels; how they often bite off a portion of the cup, puncture the acorn at the base, and if there is a larva within, quickly secure the desired morsel. Since that time other oaks have been found the fruit of which had been examined for weevil by squirrels, the acorns in some instances having been cut from the tree for that purpose by the industrious animals.

Gray squirrels may sometimes also prove a considerable check on the increase of the oak apple gall, *Amphibolips confluens* Harris.

Several years ago, while near Richmond, Staten Island, on the 6th of June, I found under a black oak, *Quercus velutina,* a great many oak apple galls that had been opened by a gray squirrel (there are no red squirrels on Staten Island), and the large and plump larva that each contained carefully extracted. In a few instances small branches, with a gall attached to each, were found on the ground, and had been gnawed off of the tree by the squirrel, for with very few exceptions these galls remain on the tree until autumn, and many so remain all winter.

The galls were opened in a very business like and practical manner. Usually a few large pieces of the outer shell were removed from one half of the gall, and about one half of the inner spongy part was then bitten away in two or three pieces. This left the other half of the gall quite perfect. There were by count over one hundred of these galls thus cut in two lying under the oak, and the squirrel or squirrels had evidently enjoyed a feast of larvae.

The next day I again found a great many galls of *confluens* which had been opened by a gray squirrel, lying under a black oak. This locality was about a mile distant from the one first discovered, and as in that lot about one half of each gall had been torn away to get at the larva within. The ground was very thickly strewn with many fragments and halves of galls. There were also several small branches that evidently had been gnawed from the tree for the sake of the galls that they bore.

On August 9 I found a third black oak from which the apple galls had been removed some time before, and the larvae secured, as in the two instances already mentioned. This was also in the woods not far from Richmond, but in another direction from the other localities.

There is every reason to suppose that the galls were opened by different squirrels on account of the distance between the localities, but no doubt some of the squirrels made a specialty of gall hunting in the proper season.

In the latter part of June I visited Todt Hill, Staten Island, where *Quercus velutina* grows in great abundance, and as in previous years I found some of the trees laden with oak apple galls. They had not been disturbed by squirrels, and only here and there had one fallen to the ground, usually a withered and deformed example.

As there are squirrels on Todt Hill, it is evident that they had overlooked the galls. The season for oak apple gall larvae is not a very long one, so unless the squirrels remember from year to year, or make the discovery anew at just about the right season, the *Amphibolips* escapes, as apparently most of them do.

At Yaphank on Long Island in May, 1913, the writer found a gall of *Callirhytis operator* O. S., that had been gnawed off of a scrub oak bush (*Quercus ilicifolia*) and partly eaten. This appeared to be the work of a gray squirrel, or perhaps of a chipmunk, and not a mouse. As in the case of Staten Island, red squirrels have never been reported native of Long Island.

A CORRECTION IN ACALYPTA (Tingididae).

Through a typographical error, the table for *Acalypta* given in No. 2, pp. 51–2, this *Bulletin* was incomplete. It should have read as follows:

Key to Species of Acalypta.

1. Bucculae united anteriorly; lateral pronotal carinae markedly diverging posteriorly (explanate margins of pronotum anteriorly truncate; roundedly angular; discoidal area comparatively short and broad; general aspect *broad;* costal area biseriate in greater part; third segment of antennae not quite twice as long as fourth; length, 2.5–3 mm.). *thomsonii* Stål
Mass., N. C., Va.

Bucculae separated anteriorly; lateral pronotal carinae slightly diverging posteriorly, subparallel 2

2. Third segment of antennae nearly twice as long as fourth; pronotal margins angularly dilated behind middle (discoidal area short; length, 2.9 mm.) ....*cooleyi* Drake
Montana.

Third segment of antennae nearly or more than three times as long as fourth; pronotal margins rounded (costal area uniseriate) 3

3. Third segment of antennae more than three times as long as fourth; discoidal area long and narrow, apex rounded; general aspect narrow; color black; length, macropterous, 3 mm., brachypterous, 2.3 mm. ....*lillianis* Bueno
Maine, Massachusetts, New York,
Maryland, North Carolina.

Third segment of antennae scarcely three times as long as fourth; discoidal area broad, acuminate; general aspect broad, length, male, 1.84 mm., female, 2.04 mm. *modesta* Parshley
British Columbia.

J. R. de la Torre-Bueno, White Plains, N. Y.

A NEW SPECIES OF ACANTHOCHEILA FROM BOLIVIA (Hemiptera-Tingitidae).

By Carl J. Drake, Ames, Iowa.

Acanthocheila tumida n. sp.

Easily distinguished from the known species by the tumid elevations (a discal elevation on each elytron) of the elytra. Length, 4.02 mm.; width, 1.95.

Moderately elongate, yellowish brown, the pronotum and portion of elytra covering abdomen fuscous. Head brown, shining; clothed with a few long, fine hairs, the spines obsolete. Antennae rather slender, clothed with numerous, long, fine hairs, yellowish, the apical segment brownish; first segment thicker and twice the length of the second, a little less than half the length of the fourth; third segment slightly curved, not quite twice the length of the fourth, the latter very long. Rostral channel shallow, open behind; rostrum stout, reaching a little beyond the meso-metasternal suture. Pronotum moderately and transversely swollen through the disc, rather coarsely punctate, broadly rounded at the apex; median carina distinctly raised, almost obsolete on the posterior triangular portion; collum triangularly elevated, areolate, truncate in front; paranota narrow, uniseriate, the areolae rather small, each lateral margin armed with nine to eleven long spines. Margins of elytra and paranota clothed with numerous, very long hairs; pronotum and the nervures of elytra with several very long hairs. The wings considerably longer than the abdomen. Legs moderately stout, yellowish brown, beset with numerous, moderately long hairs. Venter fuscous. Elytra armed with numerous, long, costal spines, the spines gradually becoming smaller distally (20 to 25 spines on each side, the apical spines not very long), the areolae much larger on the distal half; costal area rather broad (narrower on basal half) with two rows of areolae; subcostal area mostly triseriate, the costate nervure forming inner boundary passing through the apex of tumid elevation; discoidal area not distinctly differentiated from the sutural area. Areolae of paranota, costal area and distal half of elytra hyaline.

Two examples, Cochabamba, Bolivia, 1898. *Type,* female, in my collection.

LATTER-DAY HORISMOLOGY: A REVIEW.

By H. M. Parshley, Smith College, Northampton, Mass.

External Insect-Anatomy: A Guide to the Study of Insect Anatomy and an Introduction to Systematic Entomology. By Alex. D. Macgillivray. (Illinois: Scarab Co., viii + 388 pp. 1923.)

When the editor of the Bulletin asked me to review this book for his pages, I was impelled to decline on the ground that I lacked qualification as a morphologist; but this excuse has been nullified subsequently through assistance offered me by certain competent anatomists, and so I am enabled to lay before the reader, and especially the teacher of elementary classes in entomology, the opinions I have gathered in reading the work and in some attempted use of it with students.

In the first place let it be said that Macgillivray's book is an extraordinarily comprehensive and at the same time detailed account of insect anatomy. Nowhere else, I am sure, is it possible to find so many accurate statements concerning the structural features of so many species—for the most part just the species most commonly used in the elementary laboratory. And there are a few generalized illustrations of considerable value. It would seem, therefore, that the book should be universally hailed as an unmixed blessing, and indeed it will always have a place as a work of reference for the advanced students concerned for the moment with some detail not pertaining to his special group. But as a matter of fact the conversation and the correspondence of entomologists, as well as some of the reviews of the book already printed, are full of dissatisfaction and of criticism; and it is my opinion that this unfavorable attitude is well founded. The grounds underlying this dissatisfaction and this opinion I shall consider under three heads—method of presentation, accuracy of statement, and use of terms.

In the first place the book is not " an introduction to systematic entomology." It would be a rigidly foreordained taxonomist indeed who could survive such an introduction; for both the matter and the manner are frightfully hypertrophied and together bear no relation to the simple information requisite for the beginner in classification. Instead of putting the new student to tracing the evolutionary modifications of unimportant structural minutiae throughout the insect series, it would seem far wiser pedagogy to familiarize him first with the general anatomy of one insect and then, comparatively, with the features of a few others as the classifying of the various orders proceeds. No, for these reasons and others to be referred to further on this is not a book for beginners, and thus, even if we were agreed that the young should not be concerned with bibliographies, the omission of a list of sources (not to mention credit to authorities in the text) would seem to be a real weakness. And finally there is an inherent defect in manner of presentation arising from the terminology employed which is pervasive and ineradicable. Who will ever learn and remember the distinctions implied in such a series of terms, for instance, as this: ocellae, ocellalae, ocellanae, ocellarae, ocellasae, ocelli? Or this: sternacoila, sternannum, sternartis, sternellum, sternite, sternoidea, sternum? Better Kearfott's famous [*Eucosoma*] *fandana, gandana, randana, sandana, handana;* for the names of insect species do not have to be learned, and each specimen, unlike the individual sclerite, may bear a label. This new terminology, moreover, very frequently involves the substitution of the author's own fabrications for expressions already in common use ("[these] names [says Macgillivray] fortunately are not subject to the rules of biological nomenclature"—*i.e.*, to the law of priority); and this, with the almost total omission of credit to the originators of theories and the discoverers of structural features, constitutes a defect in manner of presentation which is sure to give the "beginner" a false historical perspective. The single instance of "Exopteraria" and "Entopteraria" substituted for David Sharp's *Exopterygota* and *Endopterygota* will serve to illustrate what is meant.

In the matter of accuracy of statement I do not intend to attempt a complete review of the work, for aside from the impossibility of my recognizing all the mistakes that may exist in it, I confess that I find myself quite unable to read it through. But mention may be made briefly to certain points which have come to my attention. Aside from errors like calling Johann Christian Fabricius "John Christ," and Pierre André Latreille "Jean Pierre," and in Fig. 52 calling *Gnophomyia tristissima "Elephantomyia westwoodi,"* while transposing the names in connection with Figs. 53–54 and 62–63, according to expert opinion, there are throughout the text many instances of erroneous or doubtful interpretation, set down for the most part without reference to the opinions of recent investigators. For example: On page 27 we read that the term *vertex* " is used " in two senses—to indicate the dorsal portion of the head and to indicate also " an area extending onto the ventral aspect "—whereas only the first of these uses is familiar to others than the author, I believe. On page 34 we learn that the gula is present in certain orders but wanting in such as the Isoptera, Hemiptera, etc., a notion depending perhaps on a special definition of this part, but of disputable validity. On pages 97 and 109 the maxillary and labial palpi are called exopodites, in contradiction of Crampton's clear results obtained in comparative studies on the Crustacea, while on pages 109 and 115 the interpretations given for the cardo, mentum, submentum, etc., are similarly dubious, and again, on page 144, the Dipterous labella is said to represent the paraglossae, regardless of evidence that it is really formed from the modified labial palpi. On page 115 the cervical sclerites are declared to be the " segmental part of the labial segment," although this mentum, submentum, etc., are similarly dubious; and again, on basis in embryological evidence; but here, as least, the opposite opinion is mentioned. The terms " pleuranotum " (p. 166) and " paranota "—plural: " paranotae " [*sic!*]—(p. 198) are applied in defiance of taxonomic usage, and the latter is hardly synonymous with the parapsides and juxtascutellum. What is meant on page 224 by this: " . . . the septasternum [*i.e.*, sternum of the *seventh* abdominal segment] . . . bears a pair of stylets, the appendages of the *ninth* segment " (italics mine)? On page 219 we read: " The cerci when present, evidently have a tactile function in all insects "—surely a dubious generalization.

But after all method of presentation is a debatable matter and some inaccuracy is bound to appear in any extensive body of data; and were Macgillivray's book invulnerable on other grounds it might well be accepted and recommended as a valued addition to the literature of insect morphology. There remains for discussion, however, what is really the outstanding feature of the work, namely, its extraordinary horismology. In the first place most of this terminology is superfluous, since a large percentage of the new words are applied to structures of no use in classification and unimportant from any standpoint, in spite of the author's avowed intention of preparing " not a text-book upon the external anatomy of insects, but an introduction to the study of systematic entomology." What, for instance, is the value of such appellations as orcephalic, plecephalic and cocephalic as indicating various " conditions of the foramen "; and what do they mean, etymologically? Orthoptera-like, Plecoptera-like, etc.? And what the value of oraconaris, tubularis and mandibularis as proposed on page 72? Again, as we have already remarked, this terminology is so constructed that it is unlearnable. And finally it is objectionable on linguistic grounds. We are asked to accept and use compounds made not in accordance with the genius of any language, living or dead, but after the fashion of copyright trade names. I give in evidence " predorplica," " pseudopositor," " segmasuture," " caudacoria " (in the singular), " venplica," etc., etc. As Dr. W. M. Wheeler has written of the like, they are " terms so barbarous that they make one's flesh creep." There may be some excuse, in some cases, for constructing absolutely new and purely artificial terms, but Macgillivray adopts Latin and Greek stems, roots, whole words, and case-endings, evolving such nominatives, for example, as " mandoris " and " proxadentis " and such bastard forms as " unacoria," a single word in which we have at once confusion in shades of meaning, mixture of languages, new use for an old and respectable term (corium), and a singular noun with a plural termination! Such treatment of language results in many a curious specimen, such, to take a last example, as " mecaglossa." This, if it has any meaning at all, might be understood to designate a *long glossa*; but in point of fact it is applied when this structure is greatly reduced or obsolete, " in mecopterous insects! " I have purposely refrained from indulging in the perhaps unseemly jocularity to which this work so richly lends itself, and so in conclusion it will be appropriate to state simply and seriously the judgment which, in my opinion, the book deserves.

This judgment is, in brief, that " External Insect-Anatomy " be banished from the elementary laboratory, to take its place as a reference work never to be recommended to the learner without careful warning of its nature. No greater injury could be done the young—the scientific authors of the future—than to permit them unconsciously to fill their minds with such philological novelties to the certain debasement of their sense of language; for in these times of neglect for the classics and of mass production of Ph.D.'s learned only in their narrow specialties, it is largely through the efforts of teachers to make sure that their students are nourished on text-books of high quality that American scientific writing can be maintained at a respectable level and saved from the contempt of educated readers both at home and abroad.

EDITORIAL.

On "N. Sp."

In entomology, there are two main streams of study—taxonomy and biology. Our science seems still to be in the descriptive stage, with new forms constantly added to our catalogues. This is a condition which must be recognized, but which must not be allowed to be the whole of the science; nor even its most important part.

Entomology is a part—and a quite large part—of the study of the phenomena of life. The names are but convenient tags by which to know and make known to others what it is that has been observed in life-activities.

Meantime, since new species are constantly being described, it becomes necessary to regulate this industry in some manner. Journals, in future, should accept no new genera or species for publication unless the author indicates their position as regards allied genera or species and shows how the new may be distinguished from its nearest neighbors.

The multiplication of species, genera, and higher groups imposes such a rule on all entomological publications, and we shall apply this principle to all new categories submitted, in the interests of serious workers. J. R. T. B.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

PAPUAN INSECTS.—Will collect Coleoptera, Lepidoptera and other orders. Correspondence promptly answered. T. K. Scheibel, c/o G. A. Loudon & Co., Port Moresby, Papua.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 81 Robert St., Toronto, Ont., Canada.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

OFFER.—Bred adult specimen of *Catocala herodias* in exchange for ova of species of same genus. Parent moth with ovum preferred. G. J. Keller, 68 Treacy Ave., Newark, N. J.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

One of the most beautiful red gold butterflies of the world—

Chry. virgaureae—for only 6 cents each, as long as the stock lasts. Other small species for decorative purposes at 2 cents to 5 cents each; and also exotic Lepidoptera.

Our New List of Books, Pins, Apparatus and Supplies free.

Our Price List No. 58 contains 28,000 species of Lepidoptera, the greatest and most extensive of all lists.......... $1.00

Price List No. 30 contains 30,000 species of Coleoptera.......... .50

Price List No. VII, 10,000 species of other insects.......... .50

Price of the catalogue will be allowed for in billing orders for Insects.

Kindly send price in dollar bills; or in postage stamps.

DR. O. STAUDINGER & A. BANG-HAAS
BLASEWITZ, DRESDEN, GERMANY

An Introduction to Entomology

By JOHN HENRY COMSTOCK, Professor of Entomology and General Invertebrate Zoology, Emeritus in Cornell University.

PART I—The Structure and Metamorphosis of Insects

This volume is the first part of a text-book of entomology that Professor Comstock has in preparation. It is, however, a complete treatise on the structure and metamorphosis of insects. The part now published includes four chapters. The first chapter is entitled "The Characteristics of Insects and Their Near Relatives." In this chapter the characteristics of the Arthropoda and of each of the thirteen classes of arthropods is discussed, with figures of representatives of each of these classes. The second chapter is devoted to a detailed discussion of the external anatomy of insects. The third chapter treats of the internal anatomy of insects and includes the results of recent investigations in this field. In the fourth chapter there is a detailed account of the transformation of insects, in which each of the different types of metamorphosis of insects is discussed. There is also included a bibliography and an index.

Pages, xviii + 220, with 220 illustrations. Bound in cloth. Price, $2.50 net.

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chloripe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St., -- Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XIX OCTOBER, 1924 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Smithsonian Institution
OCT 15 1924
National Museum.

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 50 cents Subscription, $1.50 per year

Mailed October 15, 1924

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1924

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
HOWARD NOTMAN

CONTENTS

GALLS THAT SECRETE HONEYDEW, Bequaert 101
TORNOS SCOLOPACINARIUS, Engelhardt 124
FIELD NOTES ON WESTERN CLEAR WING MOTHS, Engelhardt 125
ERRATA IN ANNECTANT BUGS 127
PAPILIO AJAX MARCELLUS, Rogers 127
STUDIES ON THE BLOOD OF INSECTS, III, Muttkowski 128
NOTE ON ARADUS DEBILIS UHLER, Parshley 145
BIOLOGICAL NOTE ON PLEA STRIOLA, Bueno 146
CASNONIA PICTA CHAUDOIR AND C. SUTURALIS CHAUDOIR, Schaeffer 147
WINTER FOOD FOR WATERBUGS IN AQUARIA, Hoffman 149
DISTRIBUTIONAL NOTES ON HEMIPTERA (NO. 2) CICADELLIDAE, Olsen 151
MUTILLIDS HYPERPARASITIC ON WHITE GRUBS, Hayes 153
GENERAL CATALOGUE OF THE HEMIPTERA, Parshley 154
BOOK NOTE, MOUSTIQUES DE FRANCE, Bequaert 155

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XIX October, 1924 No. 4

GALLS THAT SECRETE HONEYDEW.

A Contribution to the Problem as to Whether Galls Are Altruistic Adaptations.

By J. Bequaert, Department of Tropical Medicine, Harvard Medical School.

In my recent account of "Ants in their Diverse Relations to the Plant World" some of the activities of these insects could not be as fully treated as desirable, for lack of time and space. Thus I merely mentioned incidentally that the so-called "honey ants" sometimes gather the exudations of certain galls (J. Bequaert, 1922, p. 355). This particular subject is, however, of some importance, not alone to the student of galls, so I purpose to review the known facts and to discuss some of the theoretical problems they suggest.

Among the many strange productions associated with galls and as such due to hyperplasia or abnormal growth of plant tissue through the agency of foreign organisms, one of rather uncommon occurrence is the secretion at the surface of liquid or viscous substances, frequently emitting a fruity or aromatic smell. Although the anatomy and physiology of the organs which produce this exudation do not appear to have been studied, they very likely consist of glandular cells similar in structure and function to those found on normal organs of many plants, either in the nectar glands of flowers, in so-called extranuptial or extrafloral nectaries, or in hydathodes. If this be true, the honeydew glands of galls are but one more of those histological structures by means of which the more specialized galls often reproduce tissues or organs similar to those normally found elsewhere on their food-plant. Many latent potentialities of plant growth are thus called into activity in response to the stimulus of the gall-maker.

The glandular galls usually mentioned in the literature are all produced by cynipid wasps. Owing to their common occurrence in certain regions of southern Europe, they have been noticed there at a very early epoch. Thus Theophrastus, who died about 287 B. C., writes in his "History of Plants" (Book IV, Chapter 8): "The oak bears still another hairy gall, moreover without use, which secretes in the spring a juice resembling honey in taste as well as in touch." Plinius later copied almost textually Theophrastus's remark (Historiarum Mundi, Liber XVI, art. 9 and 10).

HONEY-SECRETING CYNIPID GALLS OF EUROPE.

The following account of the European galls known to secrete honeydew is mainly based upon observations recorded by Giraud (1859), Kieffer (1897–1901 and 1903–1905), and Trotter (1903). All these galls occur on various species of oak.

Andricus lucidus (Hartig). Austria and Italy. The appendages of the surface of the gall are swollen, red, and sticky at the tip (Wachtl, 1879; Kieffer, 1900, p. 477; Kerner von Marilaun, 1895, p. 542).

Andricus mayri (Wachtl). Austria and Sicily. The surface of the gall and of its appendages is covered with a thin layer of a smooth, yellowish green substance which is sticky when fresh (Wachtl, 1879; Kieffer, 1900, p. 479).

Andricus panteli Kieffer. Portugal, Spain, Southern France, and Italy. The gall is covered with a glutinous substance similar to that excreted by *A. mayri* (Kieffer, 1900, p. 486).

Andricus ramuli (Linnaeus). Western and Southern Europe. The long tufts of hair growing from the gall are at first covered with a glutinous secretion (Straton, in Adler, 1894, p. xxvi).

Andricus seckendorffi (Wachtl). Austria. In this case only the upper part of the appendages of the gall is red and covered with a sticky secretion (Wachtl, 1879; Kieffer, 1900, p. 491).

Andricus sieboldi (Hartig). Western and Southern Europe. H. Adler (1881, p. 172; 1894, p. 37, footnote), who observed the gall in Schleswig, writes: "The red sappy envelope secretes a sticky fluid which is eagerly sought after by ants, and that they may enjoy this nectar undisturbed they build with sand and earth a perfect dome over the galls, and in this way provide the inhabitants with the best possible protection against their enemies." Cameron (1893, p. 16) evidently misunderstood Adler's note since he credits him with the assertion that the ants cover the galls with sand and earth, "so as not to be caught themselves when getting the liquid"; he adds, however, that he also noticed ants visiting the secretion of the gall. Beyerinck (1896, p. 36, footnote) remarks that the galls of *A. sieboldi* which he found in the Netherlands were entirely dry and did not attract ants; and Kieffer (1898, p. 198), in Lorraine, also never found a secretion at the surface of these galls. According to Ráthay (1891, pp. 90–91), the honeydew of *A. sieboldi* was, however, seen by both G. Mayr and F. Wachtl, so that it seems unlikely that Adler made a confusion with some other oak gall. It is therefore possible that this gall either exudes in certain regions only or perhaps during a definite, relatively short period of its growth. Unfortunately Adler does not mention at what time of the year his observations were made. Moreover, from my experience, recorded below, with the similar North American gall of *Andricus gemmarius,* I suspect that Beyerinck and Kieffer may have observed galls whose surface had been licked dry by the ants.

Cynips calicis Burgsdorff. Southern and Central Europe and Asia Minor. According to Ráthay (1891, p. 90), this gall is visited by numerous small ants which are attracted by a sticky secretion. Kieffer and Beyerinck mention no such exudation in this species, although Paszlavszky (1883, p. 131) includes it among the galls with sticky surface.

Cynips coronaria Stefani. Austria, Hungary, and Sicily. The surface of the gall, but not that of the appendages, exudes a very sticky substance, more abundant in the upper part (Giraud, 1859, pp. 343–344; Kieffer, 1900, p. 533).

Cynips glutinosa Giraud. Austria, Hungary, and Spain. "When fresh, this gall is pale green or more or less bright red; its surface is lubricated with a sticky substance which exudes especially from the apical depression and often retains small insects that alight on it" (Giraud, 1859, p. 342; Paszlavszky, 1883, p. 131; Kieffer, 1900, p. 539).

Cynips insana Mayr. Albania, Asia Minor, and Palestine. The gall is usually covered with a resinous, shiny layer (Kieffer, 1897, p. 93).

Cynips kiefferi Cabrera. Spain and Sicily. The surface of the gall is pale brown, shiny, and feebly glutinose (Kieffer, 1900, p. 548).

Cynips mayri Kieffer. Southern Europe. The entire gall is covered with a sticky substance, most abundant on the disk where it may be 2 mm. thick, of the color and transparency of amber; it may be kneaded like wax and burns with an odor of resin (Kieffer, 1900, p. 536). Olivier (1791, p. 282) and d'Anthoine (1794, p. 36) first noticed this gall and d'Anthoine, who attributed it to an insect which he called *Diplolepis gallae umbraculatae,* mentions that insects are occasionally caught in its secretion. Boyer de Fonscolombe (1832, p. 189; *Diplolepis quercus tojae*), Bertoloni (1873, p. 3, pl.; *Diplolepis quadrum*), Fairmaire (1881 and 1882; *Diplolepis gallae viscosae*), and Solla (1892, p. 321) all made some remarks upon the same gall, but the true gall-maker was first described by Kieffer (1897, p. 8).

Cynips panteli Tavares. Portugal and Spain. Gall at first vinaceous red and covered with a viscous substance (Tavares, 1900, p. 42; Kieffer, 1900, p. 531).

Dryocosmus cerriphilus Giraud. Austria. The epidermis of the gall is lubricated with a sweet substance of which ants are very fond (Giraud, 1859, p. 354; Kieffer, 1901, p. 618).

Dryocosmus mayri Müllner. Austria. The surface of the gall is covered with a shiny and very sticky substance (Müllner, 1901, p. 526; Kieffer, 1905, p. 587).

Rhodites rosae (Linnaeus). Western Europe. The so-called " moss-gall " of *Rosa canina* secretes at the glandular tip of each filament an odoriferous gummy matter (Lacaze-Duthiers, 1853, pp. 327–328).

Honey-secreting Cynipid Galls of North America.

Andricus attractans Kinsey produces bud-galls on *Quercus wislizeni* in California. According to Kinsey (1922, p. 282), " the very sticky secretion on the surface proves attractive to ants, and likewise attracts wasps and bees."

Andricus seminator (Harris). This insect produces on various species of oak in the eastern United States a woolly, sponge-like gall. Mr. William T. Davis kindly informs me that in the vicinity of New York the gall at times secretes droplets of a very sticky substance, which was also observed by Mr. G. P. Engelhardt and and Mr. C. Schaeffer.

Callirhytis gemmaria (Ashmead). The peculiar bud-like galls of this species are not unfrequently met with on black oak (*Quercus velutina* or *tinctoria*) in the eastern United States. Felt (1918*a*; 1918*b*, p. 511) remarks that the sweetish exudation issuing therefrom during early summer attracts hosts of bees, flies, and similar insects. Weld (1922*a*, p. 21) mentions that, when young, these galls secrete honeydew from a gland at the apex and this has undoubtedly been noted by other observers, although it has not been mentioned by them in print. On May 22, 1921, during a walk through the Interstate Palisades Park, near Alpine, New Jersey, I noticed on a branch of *Quercus velutina* some of these curious galls attended by a worker ant, *Camponotus castaneus* subsp. *americanus* Mayr. Nothing unusual was then seen at the surface, but, when examined the next morning at home, a small drop of liquid was found filling the slightly depressed cup which terminates the apical " neck " of the pear- or bottle-shaped cecidium. It seems probable that the exudation was not noticed the day before, on the spot, because most or all of it had been lapped up by the ants. When collected the galls were very young, of a bright green color, and some of them had barely begun breaking through the bark of the branch. Cut off and kept indoors they slowly dried up, the ribs and grooves on their surface becoming gradually more pronounced. Yet the secretion continued for several days afterward, some of the galls still bearing a drop of liquid when examined on June 2d.

The secretion of *C. gemmaria* is restricted to the slight, cup-shaped depression at the apex. It is a clear, sticky, odorless fluid, which dries up very slowly. Considering the attraction which it exercises on ants and, according to Felt, also on other insects, one would expect it to contain some sweet substance. In order to verify this I have asked Dr. R. W. Tower, of the American Museum, New York, to test with Fehling's solution some of the galls still bearing a large droplet of exuded liquid; but the failure to produce a reduction of this reagent would seem to indicate that no glucose is present in the secretion. I feel, however, reluctant to draw a conclusion from this one experiment; better and more abundant material should be first examined. Yet this result calls for a chemical test of the secretion of cynipid galls, for I am not aware that this has been thus far attempted.

Callirhytis congregata (Ashmead). California; on *Quercus agrifolia* and *Q. wislizeni*. The galls secrete honeydew while growing rapidly (Weld, 1922*a*, p. 19).

Callirhytis balanosa Weld. Galls on acorns of *Quercus coccinea* in Illinois. " When growing in early spring they are fleshy, smooth, greenish mottled with purple, flattended, and blunt at apex, where they secrete honeydew in such quantities that it often drips to the ground " (Weld, 1922*b*, p. 18).

Callirhytis carmelensis Weld. Galls on the acorns of *Quercus agrifolia* and *Q. wislizeni,* in California. "When growing in April, they are fleshy, greenish, smooth, and secrete honeydew at apex" (Weld, 1922*b,* p. 21).

Callirhytis balanaspis Weld. Galls on the acorns of *Quercus marilandica,* in Arkansas, Missouri, Texas, Virginia, and near Washington, D. C. They secrete honeydew at apex while growing (Weld, 1922*b,* p. 22).

Callirhytis balanopsis Weld. Galls on the acorns of *Quercus marilandica,* in Missouri, Arkansas, Texas, Alabama, and Florida. "They secrete copious quantities of honeydew while growing" (Weld, 1922*b,* p. 27).

Callirhytis balanoides Weld. Galls on acorns of *Quercus velutina,* in Missouri, New York, Illinois, Virginia, and Texas. "They secrete honeydew while growing" (Weld, 1922*b,* p. 28).

Callirhytis perditor (Bassett). Galls on the acorns of *Quercus ilicifolia,* in Connecticut. Bassett (1900, p. 313) noted that ants are often seen feeding upon a liquid that exudes from the gall.

Commenting upon the honeydew frequently exuded by many of the acorn galls, Weld (1922*b,* p. 1) states that "acorn galls do not often occur in large numbers and are overlooked by the casual observer, but one is often guided to the smaller ones by noticing ants and wasps attracted by the secretion of honeydew." Similar observations have been made by my friend, Mr. W. T. Davis. On one occasion, at Jamesburg, New Jersey, September 19, 1908, he saw workers of the ant *Dolichoderus taschenbergi* var. *aterrimus* Wheeler, attending soft, young galls produced by an apparently undescribed cynipid on the very young acorns of *Quercus nana* (Davis and Bequaert, 1922, p. 15).

Disholcaspis perniciosus (Bassett). On *Quercus undulata* in Colorado. McCook (1882, pp. 24–29; see also Riley, 1880, p. 298) apparently first noticed how these galls exude at night droplets of a sweet, watery substance which is eagerly collected by the workers of the honey ant, *Myrmecocystus mexicanus* var. *hortideorum* McCook. Riley called this gall *Cynips quercus-mellaria.* Wheeler was able to confirm McCook's observations and in his "Revision of North American Honey Ants" (1908, p. 378) he figures galls of this species with exuding droplets.

Disholcaspis monticola (Gillette). "The galls of this species are black and dirty on the outer end on account of the accumulation of the dirt in the sweet substance which they secrete during growth. . . . The galls are exceedingly abundant on scrub oaks at Manitou, Colorado, and the galls are much visited by wasps and honey bees for the sweet which they secrete" (Gillette, 1893, p. 30).

Disholcaspis chrysolepidis (Beutenmüller). On *Quercus chrysolepis* in California. "This gall furnishes a sweet secretion favored by ants" (I. McCracken and D. Egbert, 1922, p. 16).

Disholcaspis eldoradensis (Beutenmüller). On *Quercus lobata, Q. durata,* and *Q. dumosa* in California. "The upper surface is pitted and exudes a sweetish secretion attractive to ants" (I. McCracken and D. Egbert, 1922, p. 16).

Neuroterus vernus Gillette. On *Quercus macrocarpa* in Iowa. This gall does not secrete honeydew, but Gillette (1890, p. 22) noticed that the punctures made in the buds by the adult gall-wasps exude a liquid. The insects were observed on April 9, depositing their eggs in the buds. About the middle of April all the females were dead on the tree. "At this time the twigs of the tree were literally covered with what would be termed 'honeydew' which had oozed out from the myriad punctures that the buds had sustained a week or ten days before. This shiny, sticky material tasted very sweet, and one who did not know what had happened to the tree a few days previous might well wonder what could be the source of this sweet substance if it did not gather as a dew." This observation is of extreme interest because it indicates that the mere mechanical or chemical stimulus of insect punctures may induce the normal tissues of oak buds to secrete honeydew, even when they do not do so under normal conditions. Since the secretion in this case is produced long before any trace of gall is visible, it could not reasonably be regarded as a protective device.

HONEYDEW SECRETED BY A CECIDOMYID GALL.

The published cases of honeydew secretion which I have listed thus far all relate to cynipid galls. I have not been able to find similar observations recorded for cecidia produced by other organisms, but the cecidological literature is so extensive that I may easily have overlooked them.

The only exception on record appears to be that of the North African cecidomyid gall of *Elaeoselinum fontanesii* Boissier (one of the Umbelliferae) which I described some years ago (J. Bequaert, 1913, p. 254). This gall, rather commonly found in June near Algiers, forms at the base of the umbella a globular swelling similar to that produced in Europe by *Lasioptera carophila* F. Löw on various other members of the same family of plants. Its surface exudes great quantities of a sweet liquid that attracts large numbers of ants, a peculiarity which has not been noted for the gall of *Lasioptera carophila.*

Significance of Honeydew Secretion in Galls.

Various theories have been propounded to account for the presence of honeydew at the surface of certain cynipid galls. From the observation of small insects found in some cases glued to the sticky surface some naturalists concluded that the secretion acted as a protection against parasitic insects, preventing them from ovipositing in the gall. T. Hartig (1878, p. 389), Paszlavszky (1883, p. 131), and Kieffer (1898, p. 197), among others, accept this explanation. Straton (in Adler, 1894, p. xxxvi) also regards the long tufts of glutinose hairs of *Andricus ramuli* as a stockade which entangles parasites before they can reach the gall. Kerner von Marilaun (1895, p. 542) writes of the gall of *Andricus lucidus* as follows: "They contain several larval chambers with abundant pithy tissue, whilst innumerable slender processes resembling limed twigs in being very sticky on the capitate thickened end project from their exterior. Ichneumon-flies and other animals hostile to the gall-producers take good care not to come in contact with these spikes." Mattei (1903 and 1904) goes much farther and claims that the galls of *Cynips mayri* are to some extent carnivorous, partly absorbing the nitrogenous matter of the trapped insects. But his views have not been accepted by any of the other students of galls, and Trotter especially (Marcellia, II, 1903, pp. xli–xlii; IV, 1905, pp. xi–xii) has raised serious objections.

Adler (1881) and Straton (in Adler, 1894, p. xxxvi) expressed the belief that, in the case of *Andricus sieboldi,* the secretion induced ants to act as sentinels in guarding the gall against parasites. This explanation finds especial favor with Delpino (1889), who includes the honeydew secreting galls among the cases of "myrcecophily" which he finds in profusion throughout the vegetable kingdom. Such galls he regards as analogous to the extra-nuptial nectaries, which, he believes, are devices purposely developed by Natural Selection in order to attract ants that in turn will act as a body-guard of the plant against phytophagous animals. Ants allured by the exudations of galls act, he thinks, in a similar manner. Ráthay (1891) also thought that the ants attracted by the viscid secretion of *Cynips calicis* were advantageous to the oak tree in killing large numbers of caterpillars and other noxious insects.

However ingenious the foregoing explanations may appear, they will chiefly appeal to the imaginative naturalist, for it must be admitted that they rest upon plausible inferences rather than upon critically conducted experiments and field observations. For instance, it has never been demonstrated that the relatively small number of galls which secrete honeydew are actually less preyed upon by parasites and other enemies than the very many galls that lack such alleged means of protection. Nor does the analogy with the secretion of extra-nuptial nectaries or hydathodes throw much additional light upon the biological significance of gall exudations. Quite apart from the fact that the physiological function of extra-nuptial nectaries is still in dispute, it is extremely dubious whether these organs are, from the point of view of the ants, anything but additional sources of food. These ubiquitous and abundant insects are forever scouting for new supplies, and they are extremely keen in detecting and exploiting to the very limit any substances that might add to their sustenance (see J. Bequaert, 1922, pp. 351–354). The entomologist acquainted with the behavior of ants has difficulty in believing that they will waste much time and energy in defending the plant or the gall. Moreover, several of the species of ants that most industriously visit nectaries and honeydew galls are among the most timid and harmless of their kin and beat a hasty retreat when they are ever so slightly disturbed.

It should be kept in mind that the nectaries found at the surface of galls are but one of a great many remarkable structures produced by these pathological plant growths. Some of these structures are undoubtedly of direct use to the gall-making animal, either providing it with food, shelter, and protection from enemies, or facilitating its escape from the gall at the proper time. For others, such as nectaries, spiny protuberances, covering of hairs, etc., the usefulness to the gall-maker is more obscure or open to question. Finally there are quite a number of features of galls which appear to be of no utility whatsoever to the animal that lives in them. In this last group I should bring the shape and color of galls which in most cases are as specifically characteristic as the structure and color of the gall-maker itself.

All these many structures, though aroused by the stimulus of the gall-maker, are, of course, produced by the plant alone, to which they appear to be not only quite useless, but represent a waste of material and energy. Frequently, too, they are decidedly detrimental either to the individual when they occur in prodigious numbers and attain large dimensions, or to the species in case they destroy flower buds, stamens, pistils, fruits, or seeds. The question may therefore be raised how such complicated growths, apparently of no utility and often distinctly harmful to the plant arose in the course of evolution. To the partisans of Natural Selection as well as to the Neo-Lamarckians the problem presents almost insuperable difficulties and it is little surprising that they have generally ignored it. Darwin, it is true, in his "Variation of Animals and Plants under Domestication" (New York, 1868, II, pp. 340–343), incidentally discusses galls as showing that conditions of life—in this case the stimulus of the gall-maker—may be a definite cause of variability. He also points out the similarity between certain gall structures and the products of bud-variation in plants. Neither line of argument, however, favors in the least the views of the selectionist.

In reviewing Weismann's "Essays," St. George Mivart (1889, p. 40) remarked, speaking of galls: "It would be very interesting to know how 'Natural Selection' (to the action of which, as everybody knows, Professor Weismann constantly appeals) could have caused this plant to perform actions which, if not self-sacrificing (and there must be some expenditure of energy), are at least so disinterested." This comment prompted G. J. Romanes (1889, p. 80) to state the case quite plainly and also to suggest a possible explanation: "Mr. Mivart," he writes, "here strikes what has always appeared to me one of the most important facts in organic nature with reference to the theory of Natural Selection. I have always so considered it, because it seems to me the one and only case in the whole range of organic nature where it can be truly said that we have unequivocal evidence of a structure occurring in one species for the exclusive benefit of another. Moreover, the structure is here a highly elaborate one, entailing not only a drain on the physiological resources of the plant (as Mr. Mivart observes), but also an astonishing amount of morphological specialization. Indeed, the latter point is so astonishing, that when we study the number and variety of gall-formations in different species of plants—all severally adapted to the needs of as many different species of insects, and all presenting more or less elaborate provisions for ministering to such needs—it becomes idle to doubt that, if such cases had occurred elsewhere and with any frequency in organic nature, the theory of Natural Selection would have been untenable, at all events as a general theory of adaptations and a consequent theory of species. But seeing that the case of galls is unique in the relation which is now before us, it becomes reasonable to attribute the formation of galls to the agency of Natural Selection, if there be any conceivable manner in which such agency can here be brought to bear. Now, although it is obvious that Natural Selection cannot operate upon the plants *directly,* so as to cause them to grow galls for the benefit of insects, I think it is quite possible to suppose that Natural Selection may operate to this end on the plants *indirectly through the insects, viz.,* by always selecting those individual larvae the character of whose excitatory emanations is such as will best cause the plant to grow the kind of morphological abnormality that is required."

In his later work Weismann (1904, I, p. 385, and II, pp. 270–272) seems to have accepted this hypothesis of an indirect selection of gall structures through the gall-maker. He states that plant galls " are a clear case of modification due to the effect, exercised once only, of external influences, as adaptation of the animal to the mode of reaction of particular plant-tissues." Weismann admits that the gall-maker has the power of exercising a succession of finely graded chemical and mechanical stimuli bringing about all the intricate structures of the gall and that this power should be referred to long-continued processes of selection. He disclaims that galls ever arise spontaneously—that is, without the presence of a gall-maker—and sees in this fact a good argument against the heredity of acquired characters.

The difficulty of explaining gall hyperplasia on the basis of the theory of Natural Selection led to a protracted discussion in volume XLI of *Nature* (1889–1890), a complete and critical account of which has been given by Trotter (1901). Some of the opinions there expressed may be briefly mentioned, chiefly because the discussion appears to have been overlooked by Becher. This author (1917, p. 18), it is true, cites Romanes, but quite incompletely and second-hand (after Küster). R. McLachlan (1889, p. 131) aptly remarked that " before rushing into arguments on this subject, more good might be done by entering into investigations of the physiological and morphological problems involved." D. Wetterhan (1889, p. 131) regarded galls as cases of symbiosis, in which "Natural Selection evidently may act in favor of each symbiont separately, provided only that the effect will not damage the other symbiont in such a degree as seriously to impair its existence." W. Ainslie Hollis (1889, p. 131) thought that he could dismiss the case by considering gall-formation "to be a pathological, that is a *perverted physiological,* process and to be due to the action of some animal irritant upon normal vegetable tissues during their period of active growth." Cockerell (1890*b*, p. 344) pointed out that "there is one way in which galls may be supposed to have been evolved as beneficial—or rather less harmful—to the plants. Every farmer is aware of the great loss to vegetation caused annually by larvae of insects boring within the branches and twigs of trees. Now suppose that all internal plant feeders were originally borers or leaf-miners—and this is highly probable—but that some had a tendency to cause swellings in which they fed. These latter would be less injurious to the plants, and the greater the vitality of the plants the more nourishment for them; and so by degrees the globular and other highly specialized and least harmful galls would be developed, by Natural Selection, for the benefit not only of the insect, but also of the plant. And known galls, which I need not here enumerate, furnish us with all the steps of this evolution." (See also Cockerell, 1890*a* and 1890*b*, pp. 559–560.)

These selectionist explanations of gall structures do not seem to stand a close critical examination. The fundamental objection which has been raised against Natural Selection as a primary cause of variation, is in this case more forceful than ever. Even if one were to admit that the various stimuli emanating from the gall-maker actually create new characters in the plant, Natural Selection has obviously nothing to do with the process. Moreover it is much simpler to suppose that the stimuli create nothing new but merely bring into play hidden potentialities of the vegetable tissues. In either case, indirect selection as advocated by Romanes and Weismann, could at most eliminate such of the gall structures that were directly harmful to the gall-maker or emphasize those that were useful to him. The several features of galls that are to all appearances of no use to the gall-producer could, of course, not be explained in this fashion, and, from the point of view of the plant, Natural Selection would nevertheless be a complete failure. It is hardly possible to regard gall-formation as a case of symbiosis of benefit to both the gall-maker and the plant; all the advantages are obviously on the side of the animal, which is plainly a parasite of the plant. Cockerell's suggestion that even the most specialized of galls were gradually evolved as a means of rendering the attacks of certain plant-feeding animals " less harmful " to the plant, also implies, to my mind, a breakdown of the power of Natural Selection so far as the interests of the plant are concerned. In gall formation the waste of material and energy by the plant is considerable and out of all proportion with the alleged end in view. Verily Natural Selection might have developed a cheaper and more efficient method of protecting the plants than to provide elaborate structures for the benefit of their enemies.

E. Becher (1917) is fully convinced that the theory of Natural Selection is wholly inadequate to account for the many complicated structures presented by plant galls. He frankly regards galls as cases of what he calls " altruistic adaptation " (fremddienliche Zweckmässigkeit), that is adaptation that is only beneficial to another, foreign organism belonging to a different species and that even appears to be especially built for the purpose.[1] In support of this view Becher first points out that "gall-bearing plants provide their parasites in a most striking fashion with food, since galls produce special nutritive tissues " (p. 21). Furthermore, they give the gall-makers shelter and " by means of many additional devices assure the safety and protection of the cecidozoa " (p. 32). Among the several " defensive devices " Becher does not fail to mention the viscous surface of certain galls. He also considers as altruistic adaptations the various structures which enable the gall-makers to leave the galls at the proper epoch of their life-cycle. So convinced is he that galls are purposely and almost intentionally grown for the sole benefit of the gall-makers, that he regards them as proof of the existence in nature of a " super-individual conscience." This is, however, a metaphysical concept which need not be considered here. Moreover, Becher admits (p. 25) that many gall structures are obviously of no use to the gall-maker and, furthermore, he exaggerates the efficacy of the protection afforded by the galls. One need not have bred many gall insects to know that they are preyed upon by hosts of parasites and inquilines which seem to find in the galls conditions just as ideal as the gall-makers themselves.

---

[1] " Diese Art von Zweckmässigkeit, die nur dem fremden Organismus zugute kommt und geradezu für ihn eingerichtet und bestimmt erscheint, wollen wir als *fremddienliche* bezeichnen." (Becher, 1917, p. 4.) Other cases of adaptation are *egoistic,* that is, beneficial either to the indiivdual itself (*selbstdienlich*) or to the species (*artdienlich*).

Plant galls are by no means the only cases in which an organism produces structures that are beneficial to another species.

(1) The so-called "myrmecophilous" plants of tropical regions possess diverse and often elaborate contrivances by means of which they give certain ants shelter or nesting abodes and sometimes also food (see J. Bequaert, 1922). It has been argued that these various structural modifications, which are at present hereditary quite independently from the presence or absence of insects, were originally developed through Natural Selection, in order that the plants might use the ants as effective guardians; but this theory is now generally discarded. I. W. Bailey (1922, p. 615) summarizes the present status of the problem as follows: "Certain plants tend—for reasons which are at present obscure—to form extra-floral nectaries, food-bodies, prostomata, saccate leaves, fistulose branches, and other pseudo-domatia, etc. In many cases, but by no means in all, these structural modifications of plants are taken advantage of by ants in their search for food and domatia. The myrmecophytic relationship which results is purely a case of parasitism in which all the advantage lies with the ants."

(2) The term "acarodomatia" is now in general use among botanists for various hereditary structures that are normally produced by certain plants and apparently serve no other purpose than to shelter mites. The shape and location of these acarodomatia often afford excellent taxonomic characters. It has been suggested that the mites might serve the plant in cleaning the surface from spores of fungi, but this view does not appear to be based on actual observation. The great similarity of many acarodomatia with true mite galls makes it more probable that these structures originated as galls, but have now become hereditary and are normally produced by the plant for the sole benefit of the mites (see Lundström, 1887).

(3) A number of Aculeate Hymenoptera possess acarid chambers, that is special cavities serving as abodes to parasitic mites. The most generally known are those in the abdomen of certain female carpenter-bees (*Mesotrichia*). They are also found in the thorax or abdomen of certain diplopterous wasps, such as *Montezumia amaliae* (Saussure), *Nortonia bisuturalis* (Saussure), *N.*

gambiensis (Meade Waldo) (=*N. acarophila* J. Bequaert), *N. caffra* (Meade Waldo), *N. braunsii* Kohl, *Ancistrocerus kisangani* J. Bequaert, *Odynerus delphinalis* Giraud, *Odynerus pedestris* Saussure, etc.; and in the abdomen of the North American crabronid *Solenius interruptus* Lepeletier. Certain beetles appear to possess similar structures. R. W. C. Shelford (1916, pp. 183–184) writes of the Bornean Brenthidae as follows: "Some of the species are much infested with mites, which cluster round the legs and on the long prothorax. I was much interested to find one day a species with a deep channel running along the greater length of the prothorax crammed with little mites. A good many species of Brenthidae have shallow open grooves along the prothorax, but in this species the groove is deep, and, though wide, is almost completely roofed in, only a narrow slit putting it into communication with the exterior. This modification of the structure for the accommodation for what appear to be mere parasites is very remarkable, but is not without parallel in the insect kingdom. Another case may be mentioned here. The Anthribidae, like their allies the Brenthidae, are also much infested with mites, and one species has a deep crescentic slit in the prothorax which is filled with the parasites."

(4) Parasitic organisms frequently alter the habits of their host and in some cases these changes may prove decidedly advantageous to the parasites. T. Hartig (1837, pp. 278–279) called attention to the curious behavior of the larva of the European sawflies *Diprion variegatum* (Hartig) and *D. pallidum* (Klug), when attacked by the tachinid fly *Ceromasia inclusa* (Hartig). Instead of making the usual, uniformly thick, and entirely closed cocoon in which to pupate, a parasitized larva first spins a completely closed but quite loose external envelope and inside this a closely woven, solid cocoon which, however, presents a broad gap at one of the poles. The fly larva pupates inside the *Diprion* cocoon and places its puparium near the open gap of the inner cocoon in such a fashion that, upon hatching, the anterior segments of the puparium are pushed forward by the head of the fly and tear asunder the loosely connected threads of the outer envelope. If this gap of the inner cocoon were lacking, the adult techinid would be unable to make its exit. Hartig concluded that the parasitized sawfly larva made special provision for the welfare of its parasite. He laid great stress upon the fact that the *Diprion* larva spins a normal, solid, and wholly closed cocoon when it is attacked by another tachinid fly, *Sturmia bimaculata*

(Hartig). In this case the presence of a gap in the inner cocoon is unnecessary since the larva itself of this *Sturmia* bores its way through the cocoon at one of the poles and pupates outside. As both species of tachinids attack the same species of *Diprion,* which in one case makes a normal cocoon and in the other provides it with a gap at one pole, Hartig was much puzzled to explain how the *Diprion* larve could be aware of the identity of its parasite.

This interesting case has recently been studied anew by Prell (1923). His observations confirm in the main those of Hartig. He adds that the gap of the inner cocoon spun by a larva of *Diprion frutetorum* (Fabricius), when attacked by *Ceromasia inclusa,* corresponds to the head of the sawfly larva. It is margined inside by a projecting collar of densely woven material which evidently replaces the cap of the normal cocoon. Prell explains this abnormal method of spinning as a direct, mechanical result of the presence of the tachinid parasite which interferes with the spinning movements of the head of the sawfly larva. He sees no need to invoke altruistic motives to explain the behavior of the sawfly. That the *Diprion* larva spins a normal cocoon when parasitized by *Sturmia bimaculata* is, according to Prell, merely due to a biological peculiarity of the parasite. The eggs of this tachinid are swallowed by the feeding *Diprion* larva; upon hatching the young fly larvae encyst in the tissues of their host where they remain quiescent until the sawfly larva is nearly full-grown. Up to that time they do not interfere much with the activity of their host which is thus enabled to spin a normal cocoon.

A similar case has been discussed by T. A. Chapman (1901). It concerns the European bagworm *Acanthopsyche opacella* Herrich-Schäffer, when parasitized by a tachinid the specific identity of which unfortunately is not stated. The puparium of the fly lies within the bag of the moth " in a mesh of loose silk which does not continue forward to the mouth of the sac, but immediately in front of the dipterous pupa, at a distance of 7–8 mm. from the mouth of the sac, forms a smooth transverse diaphragm. Through this diaphragm the Dipteron has emerged through a transverse slit, made not by the Dipteron rupturing the silk, but obviously by a weak line having been spun in just the right position by the *opacella* larva." This structure is quite different from that found in normal cocoons of *A. opacella.* Chapman does not assume altruistic intentions on the part of the bagworm, but rather tries to argue the case from the viewpoint of the selectionist: "We must suppose," he says, "that as a species (say *opacella*) alters its habits, so the parasite alters not only its own habits but the effects it produces on its hosts, and Natural Selection will favor those parasites that produce effects useful to themselves. A tachinid, for example, that made an *opacella* spin an unopenable cocoon could not thrive, but it would thrive in exact proportion to the suitability of the change *opacella* made in her cocoon to the requirements of the parasite. How the effect is produced is a very obscure matter, but it must be by some effect on the nervous system of the host, either mechanically or by the production of some agent acting chemically." Personally, however, I am more in favor of a purely mechanical explanation along the lines suggested by Prell.

I am convinced that other illustrations could easily be found of structures in animals and plants that are useful not to their owners but to foreign organisms. For several of the biocoenotic associations at present regarded as cases of symbiosis, it needs considerable skill in argument and not a little faith to be convinced that they are actually beneficial to both partners. In the cases referred to above such an admission is plainly unwarranted. While of some of them a purely mechanical explanation might be given, this appears quite imposible for the gall structures, the myrmecodomatia and acarodomatia of plants, and the mite pouches of insects. If the origin and evolution of plant galls by means of Natural Selection is, to say the least, highly improbable, it appears equally difficult to explain the myrmecodomatia, acarodomatia, and mite pouches as selective productions. Have we then to regard all such structures as "altruistic adaptations," as Becher does for the galls of plants?

Two main objections may be made to Becher's hypothesis. First, his theory is a gratuitous assumption which really falls outside the scope of Natural History as cultivated by modern naturalists, because it is impossible either to prove or to disprove it in the realm of facts. It is a good example of the extremes to which are invariably led those who maintain that every character or activity of living beings must have a purpose or at least was of some use during the evolution of the species. Such an outlook upon nature will, I am convinced, eventually be regarded as clumsily disguised anthropomorphism.

In the second place Becher's supposition of altruistic motives in the evolution of plant galls is wholly unnecessary. There is at present what seems to me overwhelming experimental evidence that characters are inherited—and perhaps even arise anew—quite regardless of their utility to the individual or to the race. Moreover, a sober consideration of taxonomy reveals that, in animals as well as in plants, many of the characters commonly employed to discriminate between varieties, species, genera, and even higher groups, are useless in life so far as we can see. The selectionist merely asks us to believe that we have not yet discovered their purpose or that they may have been of use at some time during the past history of the group. But a critical study of such characters and of their several combinations, apparently all equally successful in the struggle for existence, soon convinces one that the presence or absence of any one of them in particular is immaterial to the existence and further evolution of the group. In a recent paper F. E. Lutz (1924) has shown this quite convincingly for the details of the wing-venation of bees, which, he concludes, " seem to be much like the figures in a kaleidoscope, definite and doubtless due to some internal mechanism, but not serving any special purpose."

I have stated my reasons for disbelieving any positive action of Natural Selection in the origin and evolution of plant galls, either directly upon the plant or indirectly through stimuli emanating from the gall-maker. Nor am I inclined to regard them as intentionally elaborated by the plant for the benefit of its parasites. Both of these explanations imply teleological deductions which seem to me unnecessary, if the several peculiarities of galls are considered as non-selective structures, originally evolved without definite purpose as mechanical or chemical reactions of the plant tissues to the stimuli of the gall-maker. It is, of course, possible that some of the structures thus produced were distinctly detrimental to the gall-maker and eventually caused the disappearance of that particular type of gall together with its producer. Other productions of gall hyperplasia were eagerly exploited by, and therefore appear highly beneficial, to the gall-maker. But, in addition, there are many structures that are neither useful to the animal nor imperil its existence, and in this category I should place the honeydew and resin secreting glands sometimes found at the surface. The nectaries of galls, in particular, may well be regarded as extravagant or hypertelic structures, such as are often encountered in the more highly evolved animals and plants.

Many of the more highly specialized galls give one the impression of being morphologically distinct organisms, for they are as well characterized as most species of animals and plants. Occasionally they are even to some extent physiologically independent from their food-plant. Some of the oak galls, for instance, continue to grow and increase in size after having dropped from their support. There is, in many respects, a striking analogy between galls and lichens. The latter, too, result from the close association of two entirely unlike organisms, a fungus and an alga, producing a morphologically new type of organism. Usually the fungus has become so dependent upon its association with the alga, that it is no longer able to live by itself; but the alga is still observed as a free-living plant. There is but little doubt that in a lichen the alga is exploited by the fungus, which at most gives a certain degree of protection to its partner. Yet the association between these two organisms is of considerable ecological importance, since it allows life to thrive in environments which otherwise might remain bare of vegetation and unable to sustain animals (compact rocks, bark of trees, arctic regions, high altitudes, deserts, etc.). In a somewhat similar manner plant galls, in which animals exploit the tendency of vegetable tissues to produce complicated hyperplasia, have tremendously increased the opportunities of phytophagous organisms and of their parasites.

BIBLIOGRAPHY.

Adler, H.

1881. *Ueber den Generationswechsel der Eichen-Gallwespen.* Zeitschr. Wiss. Zool., XXXV, 2, pp. 151–246, Pls. X–XII.

1894. *Alternating generations. A biological study of oak galls and gall flies.* Translated by C. R. Straton. (Oxford), xliii + 198 pp., 3 Pls.

Anthoine, d'.

1794. *Cynipédologie du chêne roure.* Nouveau Journal de Physique, XLIV, pp. 34–39, Pl. II.

Bailey, I. W.

1922. *The anatomy of certain plants from the Belgian Congo, with special reference to myrmecophytism.* Bull. Amer. Mus. Nat. Hist. New York, XLV, pp. 585–622, Pls. XXX–XLV.

Bassett, H. F.

1900. *New species of North American Cynipidae.* Trans. Amer. Ent. Soc., XXVI, pp. 310–336.

Becher, E.

1917. *Die fremddienliche Zweckmässigkeit der Pflanzen-*

gallen und die Hypothese eines überindividuellen Seelischen. (Leipzig), 149 pp.

Beijerinck, M. W.

1896. *Ueber Gallbildung und Generationswechsel bei* Cynips calicis *und über die* Circulans *Galle.* Verhand. K. Ak. Wet. Amsterdam, Tweede Sectie, V, No. 2, pp. 1–43, Pls. I–III.

Bequaert, J.

1913. *Sur quelques cécidies observées en Algérie.* Rev. Zool. Afric., III, pp. 245–259.

1922. *Ants in their diverse relations to the plant world.* Bull. Amer. Mus. Nat. Hist. New York, XLV, pp. 333–583, Pls. XXIV–XXIX.

Bertoloni, G.

1873. *Di una nuova galla dell'eschia.* Mem. Accad. Sci. Bologna, (3) IV, pp. 1–12, Pl. I (Rendic. Accad. Sci. Bologna, 1873, pp. 145–148).

Boyer de Fonscolombe, E. L.

1832. *Description des Insectes de la famille des Diplolépiaires qui se trouvent aux environs d'Aix.* Ann. Sci. Nat., XXVI, pp. 184–198.

Cameron, P.

1893. *A monograph of the British phytophagous Hymenoptera.* Vol. IV. (London), 248 pp., Pls. I–XIX.

Chapman, T. A.

1901. Acanthopsyche opacella: *instinct altered when parasitized.* Ent. Mo. Mag., XXXVII, pp. 62–63 and 127.

Cockerell, T. D. A.

1890*a*. *The evolution of insect galls.* Entomologist, XXIII, pp. 73–76.

1890*b*. *Galls.* Nature, XLI. pp. 344 and 559–560.

Davis, W. T., and Bequaert, J.

1922. *An annotated list of the ants of Staten Island and Long Island, N. Y.* Bull. Brooklyn Ent. Soc., XVII, pp. 1–25.

Delpino, F.

1889. *Osservazioni e note botaniche. Galle quercine mirmecofile.* Malpighia, III, pp. 349–352.

Fairmaire, L.

1881. Ann. Soc. Ent. France, (6) I, Bull., p. clix.

1882. Ann. Soc. Ent. France, (6) II, Bull., pp. xvii and xxxiv–xxxv.

Felt, E. P.

1918*a*. 33d Report State Entomologist New York, (1917), pp. 63–65.

1918*b*. *Gall insects and their relations to plants.* The Scientific Monthly, VI, pp. 509–525.

Gillette, C. P.

1890. *New Cynipidae.* Entomologica Americana, VI, pp. 21–25.

1893. Ent. News, IV, p. 30.

Giraud, A.

1859. *Signalement de quelques espèces nouvelles de Cynipides et de leurs galles.* Verh. Zool. Bot. Ges. Wien, IX, pp. 337–374.

Hartig, T.

1837. *Ueber die parasitischen Zweiflügler des Waldes.* Jahresber. über die Fortschr. d. Forstwirtsch. u. Forstl. Naturk., I, pp. 275–306.

1878. *Anatomie und Physiologie der Holzpflanzen.* (Berlin).

Hollis, W. A.

1889. *Galls.* Nature, XLI, p. 131.

1890. *Galls.* Nature, XLI, p. 272.

Kerner von Marilaun, A.

1894–1895. *The natural history of plants: their forms, growth, reproduction, and distribution.* Translated by F. W. Oliver. (London), I, 1894, 777 pp.; II, 1895, xi + 983 pp.

Kieffer, J. J.

1897*a*. *Descriptions de nouveaux Cynipides d'Europe.* Bull. Soc. Ent. France, pp. 8–10.

1897–1901. *Species des Hyménoptères d'Europe et d'Algérie. VII. Les Cynipides.* (Paris), 1897, pp. 1–144; 1898, pp. 145–288; 1899, pp. 289–432; 1900, pp. 433–576; 1901, pp. 577–687; Pls. I–XXVII.

1903-1905. *Species des Hyménoptères d'Europe et d'Algérie. VIIbis. Les Cynipides (Suite).* (Paris), 1903, pp. 1–288; 1905, pp. 289–748; Pls. I–XXI.

Kinsey, A. C.

1922. *New Pacific Coast Cynipidae.* Bull. Amer. Mus. Nat. Hist. New York, XLVI, pp. 279–295.

Kranichfeld, H.

1921. *Eine neue Untersuchung über die fremddienliche Zweckmässigkeit.* Naturw. Wochenschr., XXXVI, pp. 617–623.

Lacaze-Duthiers, F. J. H.
1853. *Recherches pour servir à l'histoire des galles.* Ann. Sci. Nat. Bot., (3) XIX, pp. 273–354, Pls. XVI–XIX.

Lichtenstein, J.
1882. Ann. Soc. Ent. France, (6) II, Bull., p. xvii.

Lundstrom, A. N.
1887. *Pflanzenbiologische Studien. II. Die Anpassungen der Pflanzen an Thiere.* Nova Acta Soc. Sci. Upsaliensis, (3) XIII, No. 10, 88 pp., 4 Pls.

Lutz, F. E.
1924. *Apparently non-selective characters and combinations of characters.* Ann. New York Ac. Sci., XXIX, pp. 181–283, Pls. III–IX.

McCook, H. C.
1881. *The honey ants of the Garden of the Gods.* Proc. Ac. Nat. Sci. Philadelphia, XXXIII, pp. 17–77, Pls. I–X.
1882. *The honey ants of the Garden of the Gods and the Occident ants of the American plains.* (Philadelphia), 188 pp., 13 Pls.

McCracken, Isabel, and Egbert, Doris.
1922. *California gall-making Cynipidae with descriptions of new species.* Stanford Univ. Publ. Biol. Sc., III, No. 1, pp. 1–70, Pls. I–II.

McLachlan, R.
1889. *Galls.* Nature, XLI, p. 131.

Malpighi, M.
1687. Opera omnia. II, (London). (*De gallis,* pp. 17–38, Pls.).

Mattei, G. E.
1903. *Osservazioni biologiche intorno ad una galla.* Bull. Orto Bot. Univ. Napoli, I, 4, pp. 404–414, Pl. I.
1904. *Ancora sulla pretesa galla insettivora.* Bull. Orto Bot. Univ. Napoli, II, 1, pp. 107–108.

Mivart, St. George.
1889*a*. *Prof. Weismann's "Essays."* Nature, XLI, pp. 38–41.
1889*b*. *Galls.* Nature, XLI, pp. 174–175.

Müllner, M. F.
1901. *Neue Zerr-Eichen-Cynipiden und deren Gallen.* Verh. Zool. Bot. Ges. Wien, LI, Abh., pp. 525–530, Pls. III–IV.

Olivier, A.
1791. Article "*Diplolèpe.*" Encycl. Méthod., Hist. Nat. Ins., VI, pp. 278–282.

Paszlavsky, J.
1883. *Beiträge zur Biologie der Cynipiden.* Wien. Ent. Zeitg., II, pp. 129–132 and 171–174.

Prell, H.
1923. *Ueber eine "fremddienliche Zweckmässigkeit" bei Insekten und ihre kausale Analyse.* Biolog. Zentralbl., XLIII, pp. 432–439.

Rathay, E.
1891. *Ueber myrmecophile Eichengallen.* Verh. Zool. Bot. Ges. Wien, XLI, Sitz. Ber., pp. 88–93. (See also Nature, XLV, 1892, p. 546.)

Riley, C. V.
1880. *Honey-producing oak-gall.* American Entomologist, N. S., I, p. 298.

Romanes, G. J.
1889. *Galls.* Nature, XLI, pp. 80 and 174.
1890. *Galls.* Nature, XLI, p. 369.

Shelford, R. W. C.
1916. *A naturalist in Borneo.* (London). xxviii + 331 pp., 32 Pls.

Solla, R.
1892. *Zwei neue Eichengallen.* Zeitschr. f. Pflanzenkrankh., II, pp. 321–323, Pl. VI.

Straton, C. R.
See H. Adler, 1894.

Tavares, J. da Silva.
1900. *As zoocecidias portuguezas. Enumerçao das especies até agora encontradas em Portugal e descripçao de degesete novas.* Ann. Sci. Nat. Porto, VII, pp. 17–108, Pls. I–II.

Trotter, A.
1901. *Studi cecidologici. II. Le ragioni biologiche della cecidogenesi.* Nuova Giorn. Bot. Italiano, N. S., VIII, pp. 557–575.
1903. *Contributo alla conosscenza del sistema secretore in alcuni tessuti prosoplastici.* Annali di Botanica, I, 3, pp. 123–133.

Wachtl, F. A.
1879. *Entomologisch-biologische Studien. I. Serie.* Mitth. Forstl. Versuchsw. Oesterreichs, II, 1, (1878), pp. 91–103, Pl. IV.

Weismann, A.
1904. *The evolution theory.* Translated by J. A. and M. R. Thomson. (London), 2 vols.
Weld, L. H.
1922*a*. *Notes on cynipid wasps, with descriptions of new North American species.* Proc. U. S. Nat. Mus., LXI, Art. 18, pp. 1–29, Pl. I.
1922*b*. *Notes on American gallflies of the family Cynipidae producing galls on acorns, with descriptions of new species.* Proc. U. S. Nat. Mus., LXI, Art. 19, pp. 1–32, Pls. I–V.
Wetterhan, D.
1889. *Galls.* Nature, XLI, p. 131.
Wheeler, W. M.
1908. *Honey ants, with a revision of the American* Myrmecocysti. Bull. Amer. Mus. Nat. Hist. New York, XXIV, pp. 345–397.

Eastern Records for Tornos scolopacinarius Guenee (Lepidoptera).—A recent visit of Messrs. Cassino and Swett to the Brooklyn Museum in pursuit of their favorite study—" the Geometridae "—brought to light two specimens of *Tornos scolopacinarius,* one a female captured and presented to the Museum by Fred. M. Schott from Flatbush (Brooklyn), Long Island, April 19, 1915, and the other a male collected by the writer at Franklin Furnace, N. J., on May 17, 1924. This specimen was found in the early morning resting on an electric light pole in a swampy region with low willows the principal vegetation. The type of the species in the Brooklyn Museum comes from Texas. The only other records are from Louisiana and Florida.—George P. Engelhardt, Brooklyn Museum.

FIELD NOTES ON WESTERN CLEAR WING MOTHS (AEGERIIDAE).*

By Geo. P. Engelhardt, Brooklyn, N. Y.

The following species, collected on a western trip during the pust summer, were exhibited and discussed:

Melittia gloriosa H. Edw.—This, the largest and perhaps the most beautiful of all the N. A. clearwing moths, was observed on July 27 near Corvallis, Oregon, by myself, in company with B. G. Thompson and W. J. Chamberlin, both of the Oregon Agricultural College. The moths in their swift, graceful flight much resemble the cicada killer wasp, *Sphecius speciosus.* The larvae are borers in the enormous tubers of " Man in the ground," a cucurbitaceous plant of which the vines suggest their near relationship to the wild balsam apple (*Micrampelis*) of the East. The tubers, sometimes two to three feet long and a foot or more thick, are usually under three to ten inches of clayey soil, which becomes hard and dry by mid-summer, requiring a pick-ax for excavating. Large tubers may harbor several dozen larvae, which confine their tortuous channels to parts nearest the surface. On reaching maturity they leave their burrows to construct a tough, oblong cocoon placed vertically about two or three inches below the surface of the soil. To permit emergence of the moth the pupa must tunnel to the top of the hard-baked soil and for this purpose it is provided with structures extraordinary for strength and arrangement. Thus the head armaments might be compared to a combination of chisel and spade, while rows of strong spines on the abdominal segments pointing downward furnish the needed leverage during digging operations. The moths emerge during the early morning hours and on warm, sunny days soon begin their rapid, strong flight. The finding of *M. gloriosa* at Corvallis, Oregon, adds another State to the range of this species, heretofore recorded from California and Arizona. Further investigations should show a distribution in general following that of cucurbit plants with large root tubers, west of the Mississippi.

Synanthedon tacoma Beut.—One hundred or more specimens of this pretty species were collected by W. J. Chamberlin and myself on open meadows on the rim of Crater Lake, Oregon, August 3–4. The males were actively flying about in search of the females, which were found, with few exceptions, resting upon the leaves of an abundant plant as yet only determined as "*Polygonum* species." Several Aegeriid larvae and one pupa, the latter unfortunately crushed, were taken out of the thick, fibrous roots of this plant. Considering the great number of the moths, many of them freshly emerged, it was surprising that not more of the living pupae or any of the empty pupal shells could be found. This indicates some obscure habit during the final development which lack of time did not permit us to unravel. *S. tacoma* is a high altitude species recorded from near timberline on Mount Rainier, Jefferson, Adams and other peaks of the Pacific slope.

---

* Abstract of an address at the meeting of the Brooklyn Entomological Society, November 15, 1923.

Synanthedon frageria H. Edw.—One male from Many Glaciers, Glacier Park, Montana, July 6, and one female from Kirk, near Klamath Lake, Oregon, August 5, were collected. The specimens from Kirk, Ore., were captured on the flower clusters of a yellow aster. Search for a possible food plant revealed several Aegeriid pupal shells protruding from the root crown of a *Malva* species, a prostrate red-flowering plant growing along an old logging road. With this as the probable food plant of *S. frageria* it should not be difficult for a western collector to work up the life history of this and possibly of several closely allied species distributed throughout the Rocky Mountain system and on the Pacific Coast from California to Alaska.

Synanthedon americana Beut.—Numerous pupal shells observed on August 7 protruding from the trunks of alder trees along the path leading from the Railroad Station at Shasta Springs, to the hotel above, extend the known range of this species from Alaska southward to northern California. In habits this species is very much like the maple borer, *S. acerni,* boring below the bark and preferably in places which have been bruised or otherwise injured.

Albuna pyramidalis H. Edw.—This common species ranging throughout the N. A. continent, excepting the southern states and desert regions of the West, was encountered during July in Glacier Park, Mon., and in the Cascade Mountains of Washington and Oregon. In spite of its abundance and wide distribution nothing is known concerning its food plant and habits. A specimen in the U. S. National Museum collection is labelled "bred from stem of Rumex," but careful investigations of plants of this family have failed to duplicate this record.

Gaea solituda H. Edw.—A fine series of this rare species was received from Mr. E. J. Oslar, who reports that the specimens were collected in early August in Turkey Creek, Jefferson Co., Colorado, elevation about 6,000 feet. Females were observed ovipositing on a blue-flowering figwort (Scrophulariaceae) not yet determined.

ERRATA IN ANNECTANT BUGS.

P. 70. Authority and bibliographical reference for genus *Idiotropus* are omitted. They are as follows: Fieber, F. X., Wien. Ent. Monatschr., 4, No. 9, Sept., 1860, p. 261, pl. vi, fig. C. [Monobasic, *I. tristis* n. sp., genotype. Bohemia.]

P. 75. Heading: Genus Isometopus Fieber, omitted; should have been set on p. 75 and not on 76.

P. 77. Omit words " from above " in first line of second paragraph.

P. 77. Transfer heading: Genus Sophianus Distant, to its proper place and add heading Genus Lidopus Gibson.

P. 78. For heertofore read heretofore.

P. 79. For *liberatus* read *libertus*.

P. 82. The genus name under Poppius' first work should be Isometopidea. Transpose the figures 76 to second line above.

NOTE ON PAPILIO AJAX MARCELLUS.

A male specimen of *Papilio ajax* form *Marcellus* in somewhat battered condition was taken at Fall River, Bristol County, Massachusetts, July 12, 1923. When seen it was feeding on milkweed honey.—W. P. ROGERS, Fall River, Mass.

STUDIES ON THE BLOOD OF INSECTS.

III. THE COAGULATION AND CLOTTING OF INSECT BLOOD.[1]

By Richard A. Muttkowski, Moscow, Idaho.

1. *Introductory.*
2. *Formation of the Clot.*
3. *The Rôle of Gelatin.*
4. *The Rôle of the Corpuscles.*
5. *The Rôle of Fibrin.*
6. *Summary and Discussion.*
7. *Bibliography.*

1. Introductory.

In Vertebrate blood the abundance of erythrocytes is an important factor in forming a mechanical plug for a wound; the fibrin forms a net in which the rouleaux or agglutinated corpuscles are caught mechanically, filling up the meshes of the net. Contraction of the fibrin then seals up the wound completely. Aside from agglutinating, the action of the erythrocytes is purely passive, while the leucocytes are generally assumed to exercise some influence on fibrin formation.

In insects, as noted in a previous paper, the volume of corpuscles is about one-fortieth to one-sixtieth the volume of the plasma. A net of fibrin with such a small proportion of corpuscles acting passively would be little more than a filter or sieve, and hardly a thorough plug for a wound. In experimentation, it was found that insect blood treated with oxalate solution still forms a clot, or at least a coagulum, both *in vivo* and *in vitro,* confirming Loeb's findings for Crustacea. *In vivo,* specimens were fastened down and punctured through a drop of oxalate solution. An apparently normal clot formed. The same happened with drops caught in oxalate solution on slides. It was evident, therefore, that other elements beyond a colloidal precipitation to produce fibrin must be active in the formation of a coagulum or clot. The studies of the various factors concerned form the basis of the present paper.

---

[1] Contribution from the Zoological Laboratory, University of Idaho, Moscow, Idaho.

Before proceeding, I wish to acknowledge my indebtedness to Mr. Kenneth Collins, of Moscow, Idaho, whose kind assistance in the earlier part of this study was invaluable.

2. FORMATION OF THE CLOT.

Insect blood, even when heavily pigmented, has the advantage of transparency over vertebrate blood, which permits one to follow to some extent the activities of the various ingredients. When a drop of insect blood is placed on a slide to dry in the air, there is first a tendency to flatten out. At the surface there is a distinct flow from the center to the periphery, best observed by adding dilute India ink or carmine. This flow is chiefly of gelatin. At the margins the gelatin dries quickly and the flow is then reversed, proceeding at various points toward the center. Simultaneously, there is a marked agglutination of the leucocytes in the central area, in the form of strings and balls. Details then become obscured in the center, less so at the sides.

At the periphery the drying coagulum cracks, long before the center is dry. The marginal zone contracts and flattens, while the center bulges upward from the peripheral pressure. The bulging is, however, due in part to the contraction of the fibrin net and the pseudopodial mesh-work formed by the amebocytes. Later the center shrinks and dries, forming intricate patterns of cracks or so-called " contraction flowers."

The dried clot then shows a whitish central area which is much cracked, a subperipheral bright ring into which most of the pigments seems concentrated and supplied with relatively few radial cracks, and a peripheral transparent zone, which is faintly pigmented or clear and cracked in peripheral and radial lines (figure 1). Thin drops are similar, except that the gelatin cracks in characteristic patterns, the cracks apparently arising from nodal points which lead to other nodes and internodes (Fig. 2). The nodes appear to arise from explosions (Fig. 3). In cross-section the clot is thin in the center, with a thicker sub-peripheral ring.

Since no melanin is formed in air-dried clots, they can hardly be said to simulate living conditions. For in life at least the proximal side of a wound is moist. A moist chamber method was therefore adopted. Petri dishes with layers of wet filter paper, partly or wholly saturated or with excess of moisture, formed convenient chambers. In these the clots formed more slowly, taking an hour or longer, depending on the moisture.

The difference was apparent at once. There always was profuse melanin formation, a subperipheral color zone was less marked, and the peripheral ring narrower and generally pigmented, rarely clear. The gelatin did not crack as markedly, although it did later when removed from the moist chambers for study. On the other hand, in both thick and thin drops, the peculiar explosions would appear, in the latter even more numerous than if air-dried.

Because of the profusion of melanin it was impossible to recognize details even in thin drops. Subsequently, it was found advisable to concentrate on the various factors that might enter and study them separately rather than the clot as a unit. These factors might be the ingredient of the plasma, or the corpuscles. Staining with methyl violet showed a fibrin not in the plasma. Still, drops treated with oxalate solution to remove the calcium or with acetic acid to remove the precipitated fibrin, formed a firm coagulum. If dilute acid acetic was added to the center of the drop, the coagulum dissolved, and the solution spread out peripherally, leaving a thin coagulum in the center; the solution formed a colored circle around the central coagulum, and, as the acetic acid evaporated, formed an equally firm coagulum. The central coagulum consisted of corpuscles, while the peripheral ring was assumed to be gelatin. Hence gelatin, fibrin, and the leucocytes were studied separately as possible factors in the clotting of insect blood.

3. THE RÔLE OF GELATIN.

Because of the highly viscid nature of insect blood it was held that gelatin or some glucoprotein like mucin might be present. Treatment of fresh blood with dilute acetic acid showed no immediate coagulum, indicating the absence of mucin. With the same reagent the peripheral zone and surface of a dry drop dissolved off, leaving an irregular coagulum, consisting mainly of corpuscles and higher proteins. Such solubility indicated the presence of gelatin.

To ascertain this definitely, blood from various forms, including *Dytiscus, Aeshna, Hydrophilus, Leptinotarsa, Pieris rapae, Deilephila,* and tent caterpillars, was caught separately in oxalate solution, weak acetic acid, or alkaline solutions. The mixtures were rendered neutral, and boiled to precipitate the proteins; made alkaline with sodium carbonate and, while boiling, gradually acidified to precipitate the heat-soluble albumins and globulins. In all cases the filtrates then tested positive for biuret, very faintly or negative with Millon's reagent, positive with tannic acid, lead acetate, and half saturation with ammonium sulphate, while the addition of strong alcohol caused a precipitate—indicating the presence of gelatin.

Additional experiments were made to determine if the gelatin is in solution in the plasma or a product of coagulation, that is, secreted by the corpuscles. Various specimens were killed with fumes of potassium cyanide, hydrocyanic acid gas, chloroform, or carbon dioxide, and kept there for long periods to insure the death of the leucocytes, before used for analyses. In all cases the results were identical: gelatin is present in solution in the blood, and is not a product of coagulation. Similar results were obtained with blood caught directly in strong alcohol, and later extracted with acetic acid.

The origin of the gelatin is of interest. While perhaps secreted by other tissues into the haemocoel, it may also be secreted by the amebocytes, as will be shown presently. It is likewise probable that a thin film of gelatin surrounds the leucocytes, for a mechanical agglutination takes place in drops from specimens exposed to HCN gas and other fumes for as much as twenty-four hours. The cells sink to the bottom of the drop at once; after a minute the supernatant liquid may be decanted or washed off gently—the leucocytes remain in a thin stratum on the bottom. Strong washing does not remove all of them, for some continue to adhere to the slide. This adhesion may be explained by the assumption that in dying the corpuscles adsorb some of the gelatin or are generally surrounded by a gelatinous film (see rôle of corpuscles).

In the coagulating blood the gelatin flow is toward the periphery, where it dries rapidly in a series of retreating "tide" lines. In drying the marginal zone at once shows profuse cracking. Reference to figures 1 to 3 will show that this may be of two types: (a) the cracks begin in peripheral lines which turn in and become radial; (b) the cracks appear to arise from nodes, and form a net-work, with nodes and internodes, which result apparently from explosions. The latter are abundant in thin drops, the former confined to thick drops.

The determination of the origin of these curious "explosions" and their possible relation to clotting constituted perhaps the most perplexing problem encountered in this study. Seen under the microscope, certain corpuscles—in open drops only, not in covered ones—seem to become vacuolated, the vacuoles darkening in color. The " vacuoles " grow in size and then burst, rending the gelatin. In thin drops a few of these vacuoles were seen to arise apparently from the plasma and in no way connected with the corpuscles. Reagents such as oxalate, acetic acid, osmic acid, chloral hydrate, salt solution, and others, did not prevent their appearance and subsequent explosion, nor did exposure to HCN gas, chloroform, and KCN fumes. Fixation and staining methods proved equally unilluminating.

It was really an accident that revealed the true nature of this curious phenomenon. In certain phases of these studies I have found " naturally dead " specimens of considerable value as an aid in interpreting various details. Among such specimens, a Dytiscus adult, already swollen with decay, gave drops which showed great numbers of floating bodies, resembling loose sacs containing liquid. Some apparently were nucleated, some not; some refracted light like fat bubbles, others were plain. These sacs were observed to burst, certain ones disappearing, others fusing, or, in the marginal area, exploding and forming familiar nodes and cracks. Examination under the polarizing microscope showed the true identity of the various sacs. The " nucleated " sacs contained super-saturated solutions of carbonates; the envelopes burst and set the crystals free. The process can be seen clearly in figure 4. The non-nucleated sacs were huge fat bubbles. Hence the " explosive nodes " or " vacuoles " are fat bubbles, and not real corpuscles.

Strictly speaking, the " explosions " of the fat bubbles are not explosions at all; on the contrary, the bubbles are *pulled apart.* The explanation is simply this: With the evaporation of water from the blood the gelatin grows firm and contracts, enclosing the floating fat bubbles and those attached to the leucocytes. Since the surface tension of the fat bubble is less than the tension of the contracting gelatin, the bubbles are drawn larger and larger, until they give way—that is, " explode," although they are literally drawn apart (Figs. 2–4). With this solution in mind it was easy to demonstrate the identity of the " nodes " or " vacuoles " by treatment with concentrated sulphuric acid. The reagent destroys the tissue elements, but not the fats. At the nodal points the fat bubbles can be seen forming as the gelatin is dissolved, and then float free to the surface of the acid. Weakened acid, three parts acid with one of water, serves perhaps better, since the process of destruction is delayed sufficiently to permit careful observation. The following experiment is equally conclusive: Blood was caught in dilute alkali, which dissolves the corpuscles. On drying the gelatin showed the nodes and cracks. Hence the " explosion " cannot be due to corpuscular activity.

To determine if the plasma alone would coagulate, cyanided blood—that is, blood with all the leucocytes killed by prolonged exposure of the insect to HCN gas or KCN fumes—was treated with oxalate solution to prevent the formation of fibrin. In such cyanided drops the leucocytes fall to the bottom. Some of the drops were air-dried, others placed in semi-moist chambers. In both groups several drops were decanted after a few minutes and the decanted portion left to dry separately. In all four sets of drops a coagulum was formed, more slowly, it is true, than in drops from living specimens. The coagulum has this difference, however: It is " lumpy," or streaked, and lacks the uniformity or homogeneity characteristic of " living " drops. This disorganization becomes more pronounced, the longer the insect is exposed to poisonous fumes. As of interest, it may be noted that a similar disorganization takes place in blood from " naturally dead " specimens. As might be expected, cyanided blood does not produce any melanin.

Later on, in experimenting on fibrin, it became evident that fibrin is formed despite treatment with oxalate solution. Hence cyanided drops, as used above, were treated with dilute acetic acid to dissolve the fibrin, and the further procedure repeated. A firm gelatin coagulum formed, similar in progressive " lumpiness " to that described for oxalated drops. It would seem, therefore, that cyanides decompose the gelatin somewhat, which accords with our present knowledge of their toxic action as retarding catalyzers.

4. The Rôle of the Corpuscles.

The two main types of leucocytes, namely, the amebocytes and the chromophil leucocytes, have somewhat different activities in the formation of the clot and will be dealt with successively.

Shortly after discharge from the body the amebocytes begin to send out long fibrillar or lappet-like pseudopodia, which interlace with those of other cells, and thus form a living mesh-work. On and between the fibrillae groups of lesser bodies (sarcocytes, cell fragments, parasitic stages) are deposited. Tiny fat globules and other bodies adhere also to the cells, so that these appear studded with tiny beads. The pseudopodial mesh-work forms best at the bottom of the drop and on the surface film, as the amebocytes appear to be thigmotactic. In an ordinary drop only a small part of this activity can be followed; the color of the blood, even if faint, but particularly the quick and abundant appearance of fibrin and melanin, interferes with detailed observation.

I have found the following method valuable: Slides with drops of blood are placed in moist chambers for periods from five minutes to an hour or longer. The supernatant liquid is then gently decanted or washed off carefully. Thin drops may be diluted with water and then decanted. The leucocytes remain in place as a white residue. The decanting is necessary to remove the gelatin at the surface and the bulk of fibrin, which interfere with the penetration of the stain. The drop is then flooded with a 0.1 per cent. aqueous solution of methyl violet; stronger solutions of the stain are unsatisfactory, as they cannot be controlled. Other stains, especially those noted as " direct stains " in a previous paper on corpuscles, may also be used, according to preference. With methyl violet the corpuscles, their pseudopodia, and the fibrin stain at once. When the stain has reached a proper intensity—in one to ten minutes according to depth desired—the slide is washed gently, air-dried, and can be studied directly or mounted in gum-dammar. Or the wet slide may be mounted with glycerine, glycerine-jelly, or water glass, although the last must be used with caution, since it destroys many of the aniline stains. The wet slide may also be taken through the alcohols to balsam. In slides prepared in the foregoing manner the various details can be readily observed.

In a fresh drop the amebocytes float freely in all portions of the drop. Very quickly they attach themselves to the slide or to the surface film, where they spread out in ameboid fashion (Figs. 8, 11, 13). At the same time agglutinations are formed by the chromophil leucocytes, in which a few of the amebocytes may be included. While the agglutinations form, the amebocytes weave their pseudopodial mesh-work. The agglutinations then sink to the bottom of the drop and are caught in the mesh-work and fibrin net and thus help to plug up the various openings. This action becomes clearly evident in oxalated or acidulated drops, where little or no fibrin is present. There the amebocytes weave their pseudopodia together; later they contract them and thus tend to form a more compact mass, with reduced meshes, in which the agglutinated chromophils and other bodies are lodged. That this contraction aids in the closure of a wound is evident.

Nor does this end the activity of the amebocytes as far as the clot is concerned. They aid by forming "gelatin cells" and are also concerned with the rapid removal of the remaining plasma. Certain cells secrete gelatin into vacuoles which grow to huge size, even as large as the cell itself (Fig. 15). These gelatin vacuoles are not discharged; but because of their increased bulk they decrease the size of the meshes materially. Such "gelatin cells" show particularly fine in picro-hematoxylin and Pianese methylene blue-eosin preparations. They can also be observed directly in covered drops, and in the blood channels of detached wings.

The final action of the amebocytes is to imbibe the remaining plasma until they become impregnated with it. The process begins shortly after blood has left the body. It shows beautifully in richly pigmented blood. In the orange or orange-red blood from *Leptinotarsa* larvae the fresh leucocytes are colorless. After about three minutes of varied activity some become quiescent, that is, fixed in their shape, and soon begin to show a flocculent orange mass at one end of the cell. The orange area increases in size, until the entire cell, including the larger pseudopodia, is impreganted with the plasma pigment. During this process the cell outline remains distinct and unchanged. When stained with Pianese's stain, such cells show at first distinct retraction of the cytoplasm, and finally an invasion of it, extending through the perinuclear space, while the outline of the cell remains fixed (Fig. 16). After complete impregnation the stain shows a collapsed nuclear mass, and a thin blue line for the outline of the contracted cytoplasm; the remaining portions are colored orange like the blood plasma (Fig. 17). As noted, the original outline of the cells remains unchanged. Since staining proves a clear withdrawal of cytoplasm, it is evident that this "outline" is a residue of some sort; this I assume to be a gelatin coagulum, since it does not stain or only very faintly. Progressively, nearly all amebocytes become impregnated.

The same phenomenon occurs in other species, no matter if the blood be colored or not. In yellow or orange blood it can be observed without staining, since the impregnation carries the color of the plasma. In greenish or clear blood staining is necessary to demonstrate it; the stains then show the impregnated portion clear, since the blood plasma refuses the stain.

The following is offered as an explanation of this process: Since the amount of blood in an insect is very small, the flow from a wound must be stopped quickly. Formation of a pseudopodial mesh-work and its plugging by gelatin cells, agglutinations, and other bodies, is effective in closing a wound; while the impregnation, or imbibition, of the plasma serves to dry the clot more rapidly by the removal of liquid. Such is a somewhat anthropomorphic explanation, but the facts seem to support it. Indeed, the whole behavior of the leucocytes can be observed directly in the approximate *in vivo* conditions found in detached wings, particularly the hind wings of Orthoptera, Coleoptera, Hemiptera, and smaller Lepidoptera; the only disadvantage is that because of the small diameter of the blood channels only a few corpuscles find place for their activities.

Concomitant with the formation of the pseudopodial meshwork by the amebocytes, the chromophil leucocytes form agglutinations (Fig. 7), which vary according to the size of the drop, period of feeding, light, temperature, moisture, and other factors. In a large or thick drop agglutination is slower than in a small or thin drop. On a warmed slide the clumps of corpuscles are larger than on a cool slide, while in addition the cells tend to round up. When exposed to strong light the agglutinations become larger than in darkened chambers. Recently fed insects show agglutinations in smaller clumps than starved specimens.

Frequently there is a tendency toward "streaming," that is, a gathering along definite axes (Fig. 6). The clumps vary in size within the same drop; they may comprise from two to one hundred or more corpuscles. They may form spherical or lobular masses, and frequently long strings. Parenthetically noted, a temporary agglutination takes place after death within a specimen, in terrestrial species between twenty and thirty-six hours, in aquatic forms much sooner, between eight to twelve hours. The agglutinations then seem to dissolve, and more pronounced histolysis sets in.

In a relatively short time the agglutinations disappear from the surface of the drop and sink to the bottom where they are caught in the pseudopodial snare and the fibrin net.

To a small extent the process of impregnation is shared by the chromophils, but in the main they are concerned with clustering or agglutination. They also appear to secrete some substance during the coagulation process. Whether all of them secrete, I have not been able to determine definitely; but those equipped with a "terminal mass" (Fig. 5) proceed to discharge a portion or all of it. This discharge is discernible in favorable covered slides, and shows very well with methylene blue in soap solution (Fig. 18). One might assume that the discharges should bring about a precipitate of blood proteins, which would aid still more in filling the mesh-work; however, I cannot find the slightest evidence of a precipitation in the vicinity of the discharges. Or, assuming a lytic action, it may be that the plasma is put into condition to be absorbed by the amebocytes. The latter assumption seems the more plausible one, since the number of discharges appears to parallel the number of impregnations. But here again there is the difficulty that discharges take place at points where there are no amebocytes, and that groups of impregnated cells occur at points where no discharging cells are found. The progressive discharges and impregnations can be readily followed in covered drops, but only in richly colored blood.

5. THE RÔLE OF THE FIBRIN.

While the action of the leucocytes seems an essential factor in the formation of the clot, the blood may coagulate without their activity. This is shown clearly in cyanided specimens. The process can be controlled by gradation of the fumes. If an insect is killed by short exposure to potassium cyanide fumes, the leucocytes continue active in the usual manner. After an exposure of several hours to a few days the effect is more marked. The amebocytes lose their variegated shapes and tend to become hat-shaped or spindular, and float sideways, while the chromophils become spherical. A few more resistant ones still try to form the mesh-work, but eventually show no activity at all. The result can be obtained more speedily with HCN gas. The leucocytes then fall passively to the bottom of the drop, do not agglutinate except mechanically (see part on gelatin), and no longer extend their pseudopodia or exhibit any sign of movement. They are truly dead.

But while the leucocytes may be dead and can therefore no longer participate in the formation of the clot, coagulation nevertheless occurs. The gelatin appears peripherally and colloidal precipitation to form fibrin takes place. The two processes of gelling and fibrin formation occur even after prolonged periods of cyaniding. As a matter of fact, they take place in blood from

" naturally dead " insects. I have observed the process of coagulation and fibrin formation as much as five days after death, when the specimens were swollen with decay and filled with gas bubbles, and gave off the characteristic " fishy " odor.

In view of the foregoing, it is evident that the corpuscles are not concerned with fibrin formation. In addition, the following experiment may be cited as conclusive: Blood was caught in a small drop of dilute alkali. The leucocytes dissolved instantly, thus precluding any activity on their part. Still fibrin formed as usual, showing clearly with methyl violet. The alkali also brings about a quicker coagulation. The gelatin swells markedly, and becomes even more viscous than usual, so that it can be drawn out in threads.

In a covered drop the formation of fibrin filaments can be observed with favorable light. The process is more easily seen if a droplet of dilute India ink or carmine is added. On the whole, however, the threads are difficult to see, even with high powers, and staining is necessary. I have found methyl in a 0.1 per cent. solution excellent for the purpose, as it stains the fibrin and also the corpuscles. Greater quantities of fibrin are formed in uncovered drops placed in moist chambers.

Generally, the fibrin threads appear beaded (Figs. 9, 10). But the beads are not fibrin, since they do not dissolve in acetic acid, and appear also in drops caught in ammonium oxalate or acetic acid. These beads are formed by histolytic remnants, which are abundant at all times in insect blood and may be likened to a type of " blood dust." No structures comparable to the platelets of higher Vertebrates were found.

As in Vertebrates, the fibrin is formed from fibrinogen. A thrombin is probably also present, but I have been unable to demonstrate it. Fibrin appears very quickly, practically on contact with the air. Drops of blood caught in methyl violet show the filaments so quickly, with the immediate penetration of the stain (in *Belostoma* nymphs fibrin seems to form as the blood spurts from the wound), that an explanation on the basis of a series of inter-linked actions of thrombokinase on pro-thrombin in the presence of calcium to form thrombin, followed by saturation of thrombin with fibrinogen to produce fibrin, seems inadequate. In insects, similar to Crustacea and *Limulus,* the addition of oxalate to the blood, while causing a copious precipitate of calcium oxalate, does not prevent fibrin formation, as made apparent by treatment with stains. It is therefore evident, that the fibrin-forming colloids must be present in a more advanced stage of formation than found on Vertebrate blood. It is also evident from the speed of fibrin precipitation—nearly instantaneous with methyl violet, as noted—that fibrinogen and thrombin must be present in a state of nearly complete saturation.

The experimental evidence here given for insects is in complete line with the findings of L. Loeb and Nolf for Crustacea and *Limulus.* It is probable that, according to Nolf's theory for lower Arthropods, in insects the fibrin-forming colloids are present either as fibrinogen saturated with thrombin, or as thrombin saturated with fibrinogen, and need only the slightest contact with that Nolf has called " thromboplastic " substances, to be precipitated.

6. SUMMARY AND DISCUSSION.

The blood of insects forms a true clot, but more complex in nature than that formed by Vertebrate blood, since it is a combination of coagulation and clotting. (In most studies of Vertebrate blood the terms " coagulation " and " clotting " are used more or less synonymously, although the latter term is understood to signify the formation of a fibrin net in which the corpuscles are trapped.) Three main elements are concerned in its formation—the gelatin, the leucocytes, and fibrin.

The gelatin helps to make the clot adhere to the edges of a wound and aids in the formation of a coagulum by its rapid release of water. The chromophil leucocytes agglutinate, while the amebocytes form a pseudopodial mesh-work, in the interstices of which are lodged other corpuscles and minor bodies. Further activity of the amebocytes is to form gelatin vacuoles which serve as " plugs," and to become impregnated with the residual plasma. This process is shared in part by the chromophils, which also discharge part or all of their terminal mass into the plasma. The pseudopodial mesh-work contracts tightly, drawing the lips of the wound together and restraining the blood flow. At the same time, the imbibition of plasma serves to speed up the drying of the clot. In addition, a fibrin net-work is formed among the corpuscles and supernatant plasma, which contracts and thus brings about a still better closure of the wound and complete stoppage of blood exudation.

It is evident that the clotting of insect blood is a rather complex phenomenon and hardly to be compared to that of higher animals. As already pointed out, the factors conditioning the clotting of blood are the relative proportion of plasma and corpuscles. In Vertebrates, where the proportion of corpuscles is large, the formation of a fibrin net with a trapping of the corpuscles is sufficient to provide a mechanical plug for a wound. In insects the disparity in proportion of plasma and corpuscles is so great that the action of fibrin and gelatin needs to be supplemented markedly by the activities of the leucocytes. The latter, indeed, are of the greatest importance, if not the chief factor.

As shown experimentally under the various heads, each process may take place independently of the other, although in life they undoubtedly take place simultaneously. Clots taken directly from wounded specimens confirm the various points. Such clots are, however, somewhat difficult to study because of the melanin present; but if finely divided by free-hand sectioning, they show the details with fair clearness. In part, the gelatin can be dissolved out by acetic acid, together with most of the melanin, and the remaining mass stained and cleared with glycerine.

From an environmental standpoint the complexity of clotting offers interesting possibilities of adaptation. Environments may be neutral, acid, alkaline, or salt. Salt solutions appear to increase precipitation, but otherwise do not affect the clot. Weak acids may affect the fibrin and gelatin, but do not affect the corpuscles. Alkalis tend to dissolve the corpuscles; on the other hand, they increase the viscosity of the plasma and cause a distinct swelling of the coagulum. It would seem therefore that even if one component of the prospective clot be removed, the remaining ones are still ample enough to bring about the closure of a wound.

I have been unable to find any correlation between habitat and type of clot. It may be that the clot of an aquatic species is different from that of a terrestrial one. But since the same technique was applied to both terrestrial and aquatic forms, the differences, if present, should become apparent. None, however, were noticed, although originally I had expected to find them.

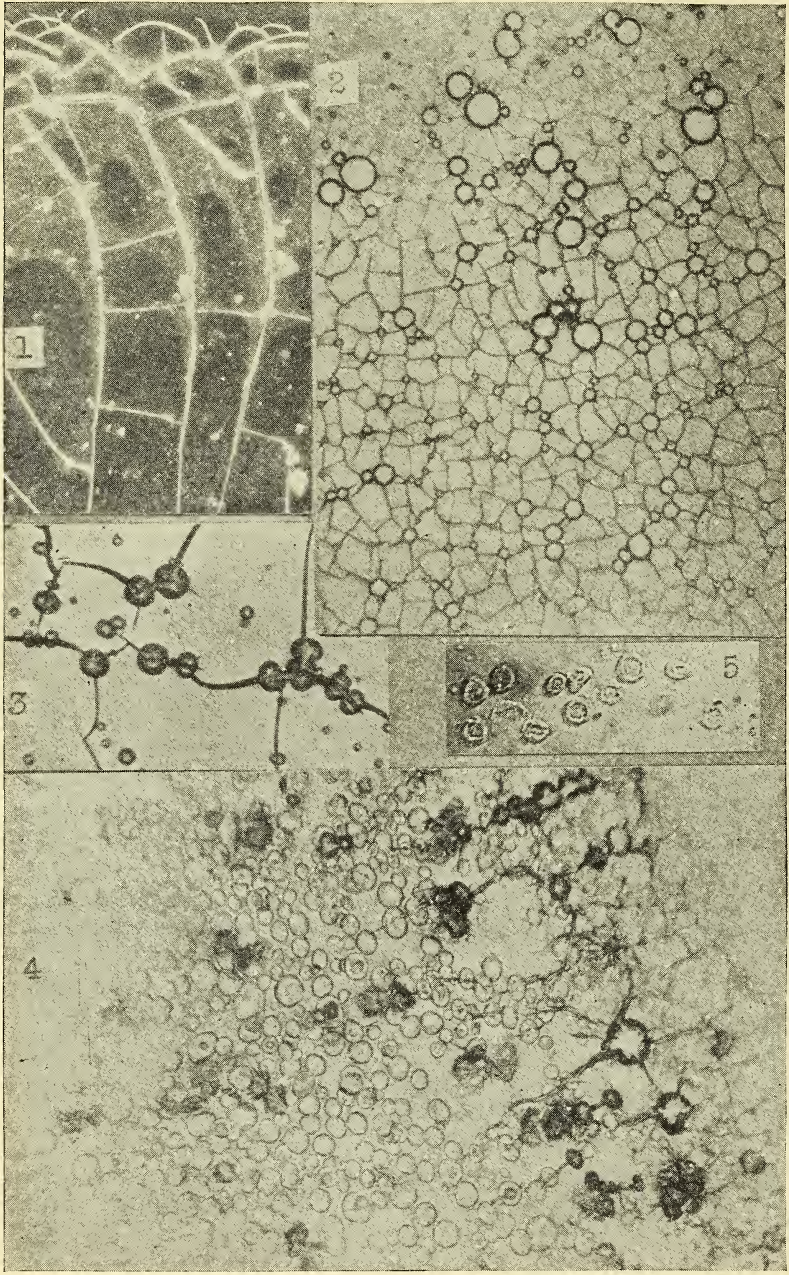
There is a distinction between the type of clot in the adults and larvae. In the former, since the corpuscles are fewer, the gelatin seems to play a more important rôle. But since most adults are short-lived, closure of wounds, from an anthropomorphic viewpoint, is of less importance to them than to the larvae. In general, however, adults are less liable to injury, as they are better protected than the larvae. Further, I have called attention to the fact that in long-lived adults, such as *Dytiscus, Hydrophilus, Belostoma,* Scarabs, etc., the proportionate number of corpuscles and the volume of the plasma is much greater than in short-lived species. In such forms the clot is typical, a product of gelatin, fibrin, and leucocytes.

7. BIBLIOGRAPHY.

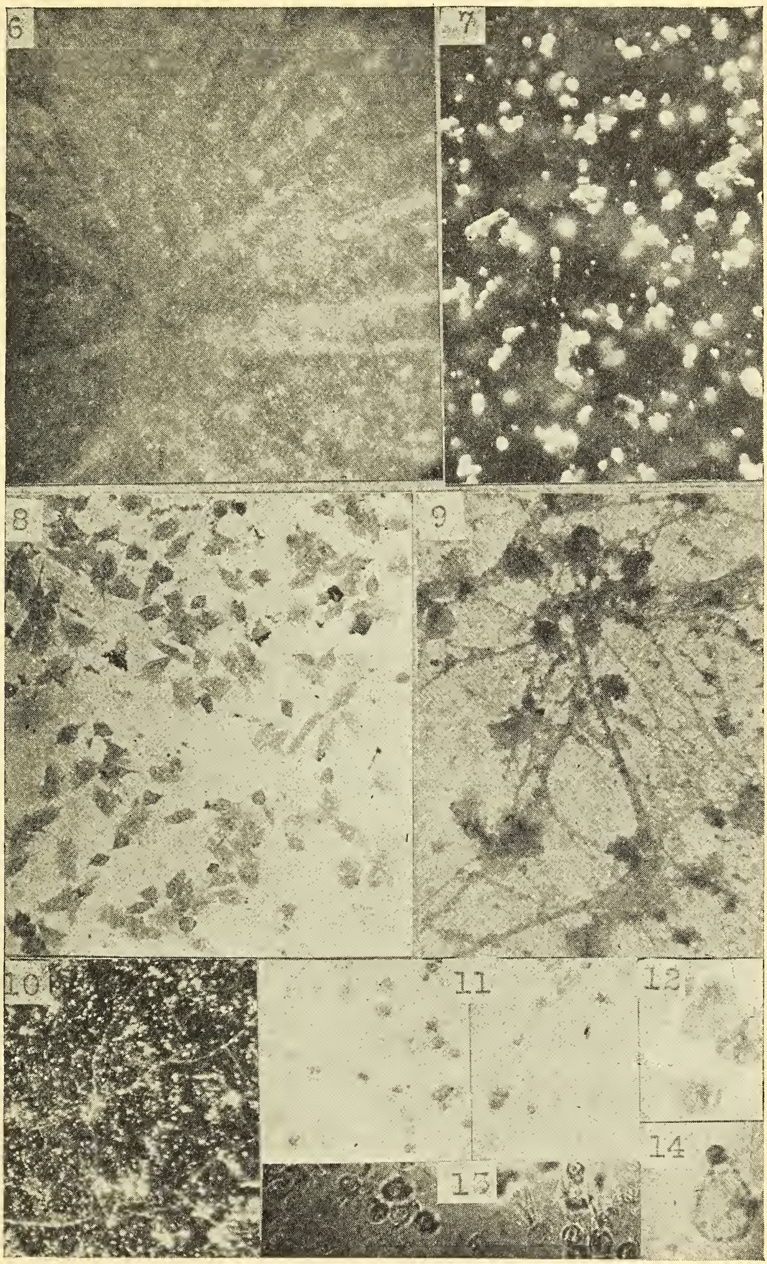
Loeb, L.
Ueber die Blutgerinnung bei Wirbellosen Tieren. Biochem. Zeitsch., Berlin, 24, pp. 478–495, 1910.
Muttkowski, R. A.
Studies on the Blood of Insects.
I. The Composition of the Blood, Bulletin Brooklyn Ent. Soc., XVIII, pp. 127–136.
II. The Structural Elements of the Blood. XIX, pp. 4–19, 1924.
Nolf, P.
Contribution a l'étude de la coagulation du sang: Le sang des Invèrtébrés, contient-il de la thrombine ou les constituents de la thrombine? Arch. Int. Physiol., 7, pp. 290–301, 1908.
La coagulation chez les crustacés. Ibid., pp. 411–416, 1908.

EXPLANATION OF FIGURES.

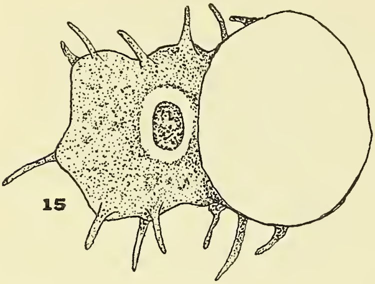
1. Cracking of gelatin in thick drop. From *Hydrophilus* adult.
2. Thin drop showing nodes and internodes, and communicating cracks. From *Enallagma* larva.
3. A portion from a thin drop, enlarged. From *Enallagma* larva.
4. Drop from dead *Dytiscus* adult, showing peripheral explosions, crystals going out of solution from sacs, and fat bubbles.
5. Secreting chromophil leucocytes. From *Leptinotarsa* larva.
6. Streaming of leucocytes in coagulating blood. From *Leptocerus* larva.
7. Early agglutination in *Dytiscus* adult.
8. Amebocytes beginning to weave their mesh-work. *Leptinotarsa* larva.
9. Fibrin net of *Dytiscus* larva. The thick thread across the middle is a pseudopodium. Note the " beads " on the fibrin threads.



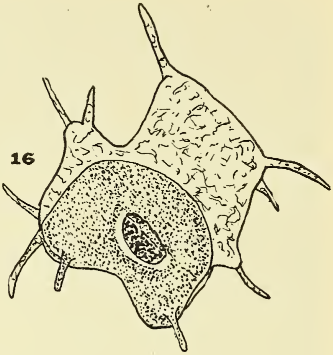
The Blood of Insects.


6
7
8
9
10
11
12
13
14

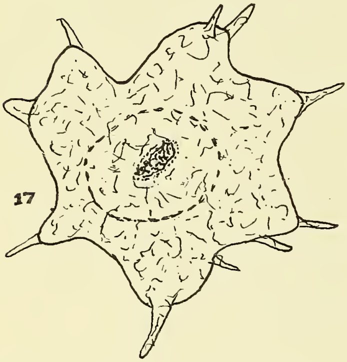
The Blood of Insects.



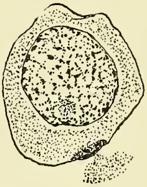
15



16



17



18

10. " Beads " on fibrin threads, *Notonecta* adult.
11. Extended amebocytes, showing lappet-like pseudopodia. *Leptinotarsa* larva.
12. Granule spheres, a special type of phagocyte. *Leptinotarsa* larva.
13. Amebocytes from *Leptinotarsa* larva.
14. Amebocyte forming large gelatin vacuole. From *Pieris rapae.*
15. " Gelatin cell "—amebocyte with enlarged gelatin vacuole. From *Dytiscus* adult.
16. Amebocyte, partly impregnated with plasma. *Leptinotarsa* larva.
17. Amebocyte, after complete impregnation. *Leptinotarsa* larva.
18. Secreting chromophil leucocyte, in the act of discharging its terminal mass. *Leptinotarsa* larva. Compare with Fig. 5.

A NOTE ON ARADUS DEBILIS UHLER.
(Hemiptera: Aradidae).*

By H. M. Parshley, Northampton, Mass.

The industrial revolution has been held to account for much that is deplorable in modern life, from the low state of contemporary art to the low birth-rate among the intelligentsia; and however debatable this notion may be in certain of its aspects there can be no denying that the machine and the factory have contributed essentially in the development of urban civilization, the settlement of the continent, and the destruction of natural conditions. As a consequence the native fauna of America is undergoing extensive modification—a few species adapting themselves to the new environment by living in human habitations or preying on the crops of the agriculturist, but by far the greater number disappearing forever as their haunts are violated in the advance of progress and improvement—and this modification is nowhere better illustrated than by the Aradidae. Living for the most part under the dead bark of trees in definite stages of decay, these insects are already well on the way to extinction; indeed, it is now impossible to find them in many areas where they were formerly abundant, and even in parks and preserves the prompt removal of fallen trees and branches prevents their survival. It was with some such ideas in mind that I composed my "*Essay on the American Species of Aradus*" (Trans. Am. Ent. Soc., XLVII: 1–106, 1921), believing that the future would have little to add to the annals of this group through the results either of collecting or of taxonomic analysis. And this perhaps somewhat bold assumption of relative finality has been largely borne out by the experience of the last three years: no undescribed species or other novelty of importance has come to light. But it is to be expected that from time to time new data will be brought forward (often based on old but hitherto unrecorded material) to modify especially our conception of the distribution of species; and such is the case in the present instance.

Aradus debilis Uhler has been found in British Columbia and the western states of Washington, Idaho, Montana, Colorado and

---

* Contributions from the Department of Zoology, Smith College, No. 121.

California, often in some abundance, but no specimen has been authentically reported from the rest of Canada or from the central states. However, I have seen and recorded doubtfully (as probably mis-labeled) a single individual from Massachusetts, maintaining that this "is most distinctly a western species"; and recently some new evidence has come in, which goes far to indicate that *debilis* is really at home in the east. While identifying the Aradids of the New York State Museum I found three specimens of this species taken at Albany in 1914 by Mr. D. B. Young, who is now assistant state entomologist. In reply to my inquiry he writes that they were taken in a piece of woodland slightly southwest of the city "and furthermore, no Aradids were received from the west in the year 1914." Thus it appears that *A. debilis* must be added to the eastern fauna, as one of the rarest species in this region. Whether or not it could have been brought hither in untrimmed logs is a question, but the march of progress has doubtless done away with this possibility for the future. The species is easily distinguished by striking characters—especially by its very long and slender antennae, with the third segment largely pale; and it is hoped that collectors will look for it in the woods as well as in their collections, so that the problem of its distribution may be solved before dead pines with their accompanying fungi have disappeared forever. The habits of *debilis* have been most excellently described in an article by H. G. Hubbard (Can. Ent., XXIV: 250–255, 1892).

Biological Note on Plea striola Fieb.

This minute back-swimmer has been briefly referred to by Dr. Hungerford in his "*Biology of Waterbugs.*"

In 1903 I had a few *Plea* in an aquarium, and on July 26 one nymph came to the last molt. Seven specimens put in the aquarium on July 25 gave a nymph emerged on August 13, 19 days later. Eggs were found inserted in the soft tissue of plants; and a sketch made at the time agrees in shape with Dr. Hungerford's description (p. 179). The sculpturing is also the same.

These brief notes are offered as independent confirmation of the facts developed by this author.

J. R. de la Torre-Bueno, White Plains, N. Y.

ON CASNONIA PICTA CHAUDOIR AND C. SUTURALIS CHAUDOIR.

By Charles Schaeffer, Brooklyn, N. Y.

In 1848 Chaudoir described in the Moscow Bulletin *Casnonia picta* from California. Several years later in 1863 in the same publication he mentions the receipt of two Mexican specimens of this species from Sallé and also another specimen from California received from Reiche. This latter specimen, he says, differs from typical *picta* in having the elytra red, the suture, apex and an elongate lateral vitta near margin black, while typical *picta* have the elytra black with an abbreviated, suboblique humeral vitta and a postmedian rounded spot reddish. In 1872 he proposes the name *suturalis* for the former, stating that he had now altogether three specimens from the old Reiche collection and that it seems to be a constant form. He considers, however, that it is only a variety of *picta.*

In Henshaw's list of Coleoptera, *C. suturalis* Chaud. is listed as a variety of *pennsylvanica* and in our new Catalogue it is made a synonym of the latter species but in both *C. picta* is omitted, though both were described from North America.

Besides the different coloration of elytra *picta* was described by Chaudoir as differing from *pennsylvanica* in having "caput pone oculos minus elongatum, latius; thorax magis cylindricus, lateribus utroque apice minus sinuatis. Elytra paulo longiora, pone medium minus dilatata, etc."

A close examination and comparison of the head of *picta* and *suturalis* with that of *pennsylvanica* shows that in the latter the head is relatively narrower and apparently more elongate behind the eyes than in the former. The shape of thorax and elytra is variable but *picta* is a larger and more robust insect and must at least be accepted as a variety of *pennsylvanica.*

In regard to coloration *pennsylvanica* is apparently quite constant but *picta* is very variable in this respect. However, the most common form of the latter is marked like *pennsylvanica* but with the common sutural spot generally more elongate, those with a more or less distinct sutural vitta and the lateral and apical black markings confluent (*suturalis*) are rare, specimens with black or piceous elytra, reddish subhumeral vitta and submedian spot (*picta*) are apparently very rare, in fact, of the numerous specimens from Texas and Arizona seen, only one specimen in the National Museum collection was of the latter form. Intermediate specimens showing more or less the extent of the black markings on the elytra are present in the material before me, though specimens from southern Texas seem to be less variable than those from Arizona. In view of this I think it is advisable to call all these *C. pennsylvanica* var. *picta* Chaud. with *suturalis* as synonym.

C. pennsylvanica is also recorded from Mexico in the Biologia but I think wrongly, the Mexican specimens marked like *pennsylvanica* which I have seen have the head and form of *picta.*

The California locality of Chaudoir's specimens is misleading. They were very likely collected in Texas or Arizona like *Amblychila piccolomini, Pasimachus californicus* and others to which Dr. Horn already has called attention.

For the loan of the excellent series of *Casnonia pennsylvanica* var. *picta* Chaud. in the National Museum I am indebted to Messrs. Schwarz and Barber. They are from several localities in Texas, Arizona and Mexico.

WINTER FOOD FOR WATERBUGS IN AQUARIA.

By William E. Hoffmann, University of Minnesota, St. Paul, Minn.

We usually think of the warmer part of the year as the only time for rearing insects. This is no doubt due to the fact that during this period of the year most insects are reproducing, so that not only life history material, but food material is readily available. On the other hand, we do not undertake rearing work during the winter because of the scarcity of food at this time of the year. Very often we wish to keep some of our life histories going during the winter. This insures a nucleus of material for rearing purposes in the spring when the same might be difficult to find afield. Furthermore, since some insects breed throughout the year it is possible to get some life histories completed during the winter.

Immediately the matter of food becomes a problem. If keeping adults is the only object in view they may be placed in low temperature where their food requirement is low because of their inactivity. Unless placed in quite low temperature, however, they will require at least some food, while if kept at room temperature they will require considerable food, and if breeding, as much food as during the summer.

There are several possible food sources. The sweeping of vegetation with an insect net will secure food until quite late in the season—although seeds are so abundant at this time of the year that they cause considerable trouble. Flies can be secured within buildings in quantities until still later and in limited quantities all winter. *Bruchus* and *Tribolium* adults may be secured in quantities from places where there are heavy infestations and kept in a large container with their respective foods, and used as needed. *Tenebrio molitor* L. larvae may be kept in like manner or even reared for that matter. *Drosophila* can be cultured on banana to which some yeast has been added, but to successfully rear them in quantities, and then capture the adults, is quite a task.

The most successful food in the experience of the writer has been cockroach nymphs. Successful because they are easy to secure, easy to handle and because they produce good healthy bugs. Five species of *Microvelia* and two species of *Velia* have been successfully reared on a straight diet of cockroaches. Several specimens of *Curicta* have been carried from the third instar to the adult on this diet while adult *Nepa, Curicta, Ranatra, Velia* and *Microvelia* have been kept through the winter.

Immediately upon hatching the nymphs are large enough to make a meal for *Microvelia* or *Velia,* while those a week or two old serve nicely for the larger waterbugs. If one has access to a place infested with cockroaches it is a simple matter to catch the nymphs. A space on the floor is cleaned, a few bits of food placed there and covered with a piece of cardboard or beaver-board. After the lights have been turned off a few minutes they may again be turned on, the cardboard lifted and dozens of the nymphs killed or crippled with a fly swatter. The clean floor makes them readily visible and they are easily picked up with a forceps. Often they will come in numbers while the lights are turned on and even during the day. The scattering of food particles or even sprinkling of water on the floor will attract them. They may also be trapped by placing a heavy paper funnel in a deep bottle, but specimens caught in this manner are unsatisfactory for they get wet and for that reason sink through the surface film of the water. *Microvelia* and *Velia* will catch living organisms beneath the surface film but they do not care for flies, cockroaches or other similar food that does not rest upon the surface. Because of this it is preferable to kill the nymphs just before feeding time. If placed on their backs they are not likely to sink and in this position the parts easiest to pierce are uppermost.

To insure a continuous supply of food, adult cockroaches bearing egg-cases may be trapped and the cases removed to containers with damp blotting paper or other damp material on the bottom. Corked bottles or glass containers with rather tight-fitting lids will serve the purpose. Upon hatching the nymphs may be reared nicely by giving them a piece of apple every few days.

DISTRIBUTIONAL NOTES ON HEMIPTERA (No. 2). HOMOPTERA CICADELLIDAE

By Chris E. Olsen, West Nyack, N. Y.

Acucephalus flavostrigatus (Donovan).

Dr. Ball reported this as taken in Vermont by Prof. A. P. Morse in 1898. Prof. Osborn reported it from the same place by Dr. C. M. Weed and also by a specimen sent him by Mr. E. P. Van Duzee taken at Phoenicia, N.Y. These two localities have so far been the only places from which this European species has been reported in the United States. Mr. Barber's collection showed it to be very common at Indian Lake, Sabael, N. Y. August, 1921, he secured a considerable number of this species of both sexes. The males and females differ a great deal in both size and color and, at the first glance, appear to be entirely different species. This condition, however, is not uncommon among Acucephalids.

Platymetopius hyalinus Osborn.

A specimen of this species was taken on the coat sleeve of a friend while walking through the streets of Yonkers, N. Y., July, 1919. Another was seen in a similar situation at Nyack, August, 1920, but this one was not captured. It seems to indicate that this maple pest is becoming quite common in our towns where maple trees are used as shade tree planting, for in both cases the streets were lined with maples, probably the Japanese variety.

Platymetopius cuprescens Osborn.

Early records of this species from New York, Colorado, Utah, Quebec, and two localities from Maine were all reported by single captures. It is shown by later reports to have occurred from Quebec to South Carolina and westwards to Utah. Mr. H. G. Barber has taken more than a usual number in bringing home five specimens from Indian Lake, Sabael, August, 1921.

Phlepsius franconianus Ball.

This was described by Dr. E. D. Ball from a single male taken by Mrs. Annie Trumbull Slosson at Franconia Notch, N. H. The female was subsequently collected and described by Prof. Herbert Osborn from a specimen collected at Orono, Maine. Lathrop in his *Cicadellidae of South Carolina* reports another capture of a female from that state. These are so far all the known specimens of this species. A fourth specimen, a female, is at hand from Bayshore, Long Island, collected by the writer on July 4, 1915. This record is of interest in that it tends to connect up the wide gap between New Hampshire, Maine and South Carolina and at the same time establish a record for both our Long Island and New York State lists.

Phlepsius maculatus Osborn.

A single specimen of this rather rare species was collected at Bronxville, N. Y., July 30, 1912, and was presented to the writer by Mr. L. Woodruff. Previously, this species was known from Ohio only.

Phlepsius incisus Van Duzee.

An additional record for New York–Indian Lake, Sabael, August, 1921, by H. G. Barber; five specimens; usually reported by odd captures.

Phlepsius tennessa De Long.

A specimen of this species was taken at Kissena Park, Flushing, L. I., August 20, 1911, by the writer. Another specimen came to hand from Penniquid Barrens, Coram, L. I., VII–1921, by George P. Engelhardt. Previously described and reported from Tennessee and South Carolina only.

Thamnotettix eburatus Van Duzee.

Mr. H. G. Barber added another record of a single capture. The specimen was taken at Indian Lake, Sabael, N. Y., August, 1921. Described from specimen taken in Muskoka Lake District. Citing Prof. Osborn, "It is rather rare and northward in distribution." It is surely northward in distribution and rare also, but perhaps when more collecting is done in these northern locations, it will appear more often in the net.

TWO MUTILLIDS (HYM.) HYPERPARASITIC ON WHITE GRUBS (SCARAB., COL.).[1]

By Wm. P. Hayes, Kansas Agricultural Experiment Station,
Lawrence, Kans.

Davis (1919, pp. 73–76),[2] in his work on the natural enemies of white grubs and May beetles of the genus *Phyllophaga,* discussed the bionomics of *Elis quinquecincta* Fabr. (=*E. sexcincta* Fabr.) as a parasitic enemy of white grubs. At the close of the discussion (p. 76) he remarked, "We have never reared parasites from *Elis,* but Mr. Otto H. Swezy[3] reared . . . two Mutillids (a male *Mutilla castor* Blake and a female *M. ferrugata* Fabr.) from cocoons of *E. sexcincta* (=*E. 5-cincta*) collected at Urbana, Ill." So far as the writer is aware, these are the only references to Mutillids as parasitic on primary parasites of white grubs.

The writer wishes to record the rearing of two species of Mutillidae from cocoons of *Elis quinquecincta.* One cocoon was collected in the soil at grass roots on a high upland prairie on October 6, 1919. It was brought to the field insectary and kept on moist soil. Ten months later (August 19, 1920) a female Mutillid emerged which was identified by comparison with specimens determined by C. E. Mickle as *Mutilla quadriguttata* Say.

Since *M. quadriguttata* is parasitic on *Elis,* which in turn is parasitic on the larvae of Scarabaeidae, speculation as to the length of life of the hyperparasite is of interest. *Elis* lays its eggs on the larva of *Phyllophaga* in the soil. The *Elis* larva grows rapidly and spins its cocoon the same season. In this instance the *Mutilla* must have attacked the *Elis* in 1919, before the cocoon was spun, and matured in 1920, a fact pointing strongly to a one-year life cycle for the hyperparasitic *Mutilla.*

A second Mutillid was reared from a cocoon of *Elis* collected under six inches of soil on an upland prairie, March 24, 1923. A male, determined as *Dasymutilla permista* Mickle by comparison with paratypes, emerged on July 20, 1923.

---

[1] Contribution No. 336, from the Entomological Laboratory, Kansas State Agricultural College.

[2] Davis, J. J., Contributions to a Knowledge of the Natural Enemies of Phyllophaga. Ill. Nat. Hist. Surv. Bul., Vol. 13, Art. 5, pp. 53–138, 1919.

[3] Swezy, Otto H., Some Hyperparasites of White Grubs. Proc. Hawaiian Ent. Soc., 3: 71–72, 1915.

GENERAL CATALOGUE OF THE HEMIPTERA.

The trustees of Smith College have agreed to undertake the publication of a catalogue of the Hemiptera of the world, as an item in the celebration of the fiftieth anniversary of the founding of the college. This work will appear in fascicles as the various specialists complete their portions.

At the last meeting of the American Association for the Advancement of Science (Cincinnati, 1923) a group of entomologists interested in the volume suggested the organization of an editorial board for the catalogue as follows:

General Editor: Dr. G. Horvath, National Museum, Budapest, Hungary.

Managing Editor: Dr. H. M. Parshley, Smith College, Northampton, Mass.

Mr. H. G. Barber, Roselle, N. J.
Dr. E. Bergroth, Ekenäs, Finland
Dr. C. J. Drake, Iowa State College
Dr. W. D. Funkhouser, University of Kentucky
Dr. H. B. Hungerford, University of Kansas
Dr. H. H. Knight, University of Minnesota
Dr. Z. P. Metcalf, North Carolina State College
Mr. J. R. de la Torre-Bueno, White Plains, N. Y.

Authorship of certain fascicles has been agreed upon and it is expected that specialists in various countries will be found to complete the list. Perhaps what has always failed of completion as the effort of one or two authors will succeed as a work of international cooperation. The Latin, French, German, or English languages may be employed by authors. Persons interested in the catalogue are invited to communicate with the managing editor, either directly or through any member of the board.

The fascicles will be sold at a very moderate price, and it is hoped that individuals and institutions will make early indication of their intention (without legal obligation) to subscribe for the whole. Such subscribers will receive each fascicle promptly upon publication and thus assure themselves ultimate possession of the complete work.

H. M. Parshley,
Smith College, Northampton, Mass.

BOOK NOTE.

Histoire Naturelle des Moustiques de France. Etude Systématique et Biologique des Moustiques de l'Europe Centrale et Septentrionale et de leurs Parasites. By E. Séguy. (Published by Paul Lechevalier, Paris, 1923.) One volume duodecimo of 225 pp. with 201 figures.

Owing to the rising tide of tropical medicine the mosquitoes of the warmer parts of the globe have attracted the attention of many workers during the last twenty-five years. Meanwhile these insects were somewhat neglected in Europe where the Great War appears to have been responsible to some extent for a renewed interest in their study. Since 1915 much important work has been done there, notably by Wesenberg-Lund in Denmark, Martini and A. Kuntze in Germany, and W. D. Lang and F. W. Edwards in England. Though Brolemann and Villeneuve have published a few short notes on French mosquitoes, the taxonomy of these insects in recent years has been mainly the work of M. E. Séguy. During 1920 and 1921 this entomologist published in the *Bulletin* of the Paris Museum a revision of the mosquitoes of France. These articles have now been combined under the above title into a handy volume of the series "Encyclopédie Pratique du Naturaliste."

The bulk of the book consists of dichotomic, illustrated tables for the ready identification of larvae and adults, and an enumeration of the species with synonymy, distribution records, and biological data. The author includes in his work the Chaoborinae (or Corethrinae) and the Dixinae, two groups of non-biting insects which are more often given family rank. The mosquitoes proper he divides into three subfamilies (for the French species): Culicinae, Aëdinae, and Anophelinae. While these groups may have some practical advantages, they are certainly not of the same phylogenetic value as the Chaoborinae and Dixinae with which they are apparently given equal rank. To the general student of Diptera the distinction between Aëdinae and Culicinae appears to be wholly artificial. The terminology used by the author is explained in an extended introductory part, which also discusses the characters of the family, the internal and external anatomy, the structure of larvae and pupae, and the general ecology. An interesting chapter is devoted to the internal and external parasites and the predaceous enemies of the mosquitoes. In this connection I may point out that the curious method by means of which the eggs of *Dermatobia* are carried to the host was not discovered by Surcouf as Séguy states (p. 47). Dipterous eggs attached to an American mosquito appear to have been first noticed by R. Blanchard about 1900, but in 1910 Dr. Morales definitely asserted that these eggs belonged to *Dermatobia* and that the fly actually oviposits on the mosquito. The history of the case is well given by Surcouf in the "Compte-Rendus" of the French Academy of Sciences for 1913 (Vol. CLVI, pp. 1406--1408).

The various methods of collecting and breeding mosquitoes are also briefly dealt with, while a concluding chapter summarizes the most important facts from a practical point of view, especially with regard to the diseases these insects are known to transmit. A useful bibliography concludes the book, while many additional references, compiled with unusual care, are scattered through the text.

On the whole this little volume forms an excellent introduction to the study of mosquitoes and may be used with advantage even outside the geographical limits for which it was formally intended. In the face of present economic conditions the price (francs 15) seems moderate enough, at least from a distance. It is a matter of regret that the poor quality of the paper hardly does justice to the author's drawings, some of which are quite elaborate and elegant.

The present opportunity may be used to call attention to three other important works recently published by M. E. Séguy: "*Les Insectes Parasites de l'Homme et des Animaux Domestique*" (1924), "*Diptères Anthomyiaires*" (1923, as part VI of a general Fauna of France), and "*Les Moustiques de l'Afrique du Nord, de l'Egypte et de la Syrie*" (1924).

J. Bequaert,
Department of Tropical Medicine of
Harvard University Medical School.

One of the most beautiful red gold butterflies of the world—

Chry. virgaureae—for only 6 cents each, as long as the stock lasts. Other small species for decorative purposes at 2 cents to 5 cents each; and also exotic Lepidoptera.

Our New List of Books, Pins, Apparatus and Supplies free.

Our Price List No. 58 contains 28,000 species of Lepidoptera, the greatest and most extensive of all lists	$1.00
Price List No. 30 contains 30,000 species of Coleoptera	.50
Price List No. VII, 10,000 species of other insects	.50

Price of the catalogue will be allowed for in billing orders for Insects.

Kindly send price in dollar bills; or in postage stamps.

DR. O. STAUDINGER & A. BANG-HAAS
BLASEWITZ, DRESDEN, GERMANY

An Introduction to Entomology

By JOHN HENRY COMSTOCK, Professor of Entomology and General Invertebrate Zoology, Emeritus in Cornell University.

PART I—The Structure and Metamorphosis of Insects

This volume is the first part of a text-book of entomology that Professor Comstock has in preparation. It is, however, a complete treatise on the structure and metamorphosis of insects. The part now published includes four chapters. The first chapter is entitled "The Characteristics of Insects and Their Near Relatives." In this chapter the characteristics of the Arthropoda and of each of the thirteen classes of arthropods is discussed, with figures of representatives of each of these classes. The second chapter is devoted to a detailed discussion of the external anatomy of insects. The third chapter treats of the internal anatomy of insects and includes the results of recent investigations in this field. In the fourth chapter there is a detailed account of the transformation of insects, in which each of the different types of metamorphosis of insects is discussed. There is also included a bibliography and an index.

Pages, xviii + 220, with 220 illustrations. Bound in cloth. Price, $2.50 net.

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XIX DECEMBER, 1924 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Smithsonian Institution
DEC 15 1924
National Museum.

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed December 10, 1924

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1924

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
HOWARD NOTMAN

CONTENTS

RELATIONS INDICATED BY MANDIBLES OF HOLOMETABOLOUS INSECTS, Crampton 157
COLLECTING NOTES (Lepid)), Bell 163
A NEW N. A. MICROVELIA, Hussey 164
A CHANGE OF NAME (Miridae), Hussey 165
REVISION OF THE GENUS BASILARCHIA, Nakahara 166
SYSTEMATIC POSITION OF DASYGASTRAE, Robertson 181
SEVENTEEN YEAR CICADA ON LONG ISLAND, Davis 182
DIABROTICA TRICINCTA INJURIOUS IN NEW MEXICO, Chittenden 184
PRELIMINARY SURVEY OF MICROVELIA OF THE WESTERN WORLD, WITH A N. SP., Bueno 186
THE NEXT OF KIN, Malloch 195
PROCEEDINGS OF THE SOCIETY 196
NOTICE TO SUBSCRIBERS 199

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XIX December, 1924 No. 5

NOTES ON THE RELATIONSHIPS INDICATED BY THE MANDIBLES OF CERTAIN HOLO-METABOLOUS INSECTS.

By G. C. Crampton, Ph.D., Massachusetts Agricultural College, Amherst, Mass.

To Dr. J. W. Campbell, I am deeply indebted for much of the material used in the preparation of this and several other papers dealing with the morphology of insects, and I would make use of this opportunity of expressing my deep appreciation of the aid so generously extended by Dr. Campbell and by Messrs. T. R. Harris, E. Gourlay, S. Lindsay, F. Tapley and other New Zealand entomologists whom Dr. Campbell has interested in my behalf.

The evidence of the maxillae (Crampton, 1923a) and of the labium (Crampton, 1923b), as well as that of the head-capsule. thorax, and other structures studied in the papers cited in the appended bibliography, would point to a close relationship between the Diptera, the Mecoptera, and the Neuroptera; and a study of the mandibles would strengthen the view that these insects are extremely closely related. Thus, the mandible of the Neuropteran shown in fig. 4 is a slender, blade-like structure clearly exhibiting evolutionary modificational tendencies which find opportunity for further development along these lines, in the mandibles of such Diptera as the one shown in fig 9, while essentially similar tendencies are exhibited in the slender mandible of the Mecopteran shown in fig. 6. The shorter mandible of the Mecopteran shown in fig. 2 is rather suggestive of the Neuropterous type shown in fig. 1, in that both are only slightly slender, and their gnathodentes, or tooth-like projections *gd*, are apparently not much used for mastication.

The mandible of the Trichopteran shown in fig. 3 is not as similar to that of the Lepidopteran shown in fig. 5 as would have been the case if such Lepidoptera as *Micropteryx,* etc., had been chosen to illustrate the types of mandibles occurring in the order Lepidoptera.

The Lepidopteran shown in fig. 5 has preserved the mandible in such a primitive (Orthopteroid) condition, that it points to an ancestry for the Lepidoptera in forms more primitive than any depicted here. Similarly, the maxilla of the Lepidopteran *Micropteryx* is of such a primitive nature that it also points to an ancestry for the Lepidoptera in forms which must have been as primitive as certain Neuroptera, as was pointed out in a previous paper (Crampton, 1923a). The evidence of the maxillary and mandibular structures of the insects in question would therefore point to an ancestry for the Lepidoptera in forms more primitive than either the Mecoptera or the Trichoptera, which are usually regarded as the types ancestral to the Lepidoptera; and instead of attempting to derive the Lepidoptera from Mecoptera or Trichoptera, it is preferable to regard the Mecoptera, Trichoptera and Lepidoptera as representing lines of descent of equal value, having a common Neuropteroid or pre-Neuropterous origin—as is also indicated by a study of the wing-veins (Crampton, 1922) and other structures as well.

The labium of the Coleopteran *Rhipiphorus* is so similar to the labium of the bumblebee, and other Hymenoptera, that one would expect that the mandible of this Coleopteran, shown in fig. 7, would be more like that of the Hymenopteran shown in fig. 8, than is the case, especially since the thoracic sclerites of the Coleoptera are very like those of certain Hymenoptera, and many other features point to a very close relationship between these two orders of insects.

The chief purpose of including here the type of Coleopterous mandible shown in fig. 7 is to indicate that the tendency for the mandible to become a slender elongated structure in higher Holometabola (such as Mecoptera, Diptera, etc.) is presaged, so to speak, even in such primitive Holometabola as the Coleoptera, and on this account, the type of Coleopterous mandible shown in fig. 7 is not as suitable for indicating the close relationship between the Coleoptera and Hymenoptera as would have been the case if other forms had been selected for this purpose. If one compares fig. 7 with fig. 8, however, it is evident that the Coleopterous mandible here figured resembles that of the Hymenopteran more than any other types shown in the plate, particularly in the presence in both Hymenoptera and Coleoptera of the peculiar articulatory " acetabulum " or gnathacetabulum labeled *ga* in figs. 7 and 8. This articulatory " acetabulum " pivots upon a condyle-like structure (the epicondyle) borne at the postero-lateral angle of the clypeus, and only among the Coleoptera and Hymenoptera here figured is such a structure strongly developed, thus clearly indicating a rather close relationship between the Coleoptera and Hymenoptera. A well marked hypocondyle, labelled *hc* in fig. 8, which articulates with an acetabulum in the hypostomal region of the head capsule, is likewise present in both Hymenoptera and Coleoptera, although it is not visible from the angle at which the mandible shown in fig. 7 was drawn.

Two methods of separating the Holometabolous insects into superorders have been suggested, and it is largely a question of determining which structures are of the greatest diagnostic value, in deciding where to place such synthetic types as the Neuroptera, which combine in themselves so many characters common to both superordinal groups.

If we compare the ovipositor of the Neuropteran *Raphidia* with that of the Hymenopteran *Xyela,* the two are so astonishingly similar that this would indicate that the Neuroptera are extremely closely related to the Hymenoptera. Similarly, the head capsule, mouthparts, and other features of the larvae of the Neuroptera are so much like those of Coleopterous larvae, that it is impossible to find any larval characters which would separate the Neuroptera from the Coleoptera in every case. Furthermore, in the adult stages, the ligula of the labium is retained in most Neuroptera, Coleoptera, and Hymenoptera, while it is absent in the rest of the Holometabola. These, and many more facts would indicate that the Neuroptera should be grouped with the Hymenoptera and Coleoptera (including the Strepsiptera) in one superorder (the Panneuroptera) comprising the lower Holometabola, while the rest of the Holometabola, such as the Siphonaptera (fleas), Diptera, Mecoptera, Trichoptera and Lepidoptera, should be grouped in another superorder (the Panmecoptera) comprising the higher Holometabola.

On the other hand, if we base the division of Holometabolous insects upon other diagnostic characters such as the presence of a meron, or posterior division of the coxa, in the mesothoracic leg, the Neuroptera (which have such a division of the mesothoracic coxa) could not be grouped with the Hymenoptera and

Coleoptera, and would have to be placed with the higher Holometabola in a group composed of the Siphonaptera, Diptera, Mecoptera, Trichoptera, Lepidoptera and Neuroptera (*i.e.,* the "Panneuroptera"), as distinguished from the other Holometabola such as the Hymenoptera, Coleoptera and Strepsiptera (*i.e.,* the "Pancoleoptera"). Certain venational characters of the Neuropteran *Sialis,* and the character of the mesonotum of such Neuroptera as *Nemoptera* would lend weight to the view that the Neuroptera belong with the Mecoptera and other higher Holometabola, rather than with the Hymenoptera, Coleoptera, and other lower Holometabola; but the preponderance of important structural details is on the side of grouping the Neuroptera with the lower Holometabola, rather than with the higher Holometabola.

Unfortunately, the mandibles furnish no very conclusive evidence one way or the other, in the matter of attempting to decide where to group the Neuroptera, since the mandibles of some Neuroptera resemble those of the Diptera, Mecoptera, and other higher Holometabola, while the mandibles of other Neuroptera are more like those of the Coleoptera and Hymenoptera among the lower Holometabola, so that the evidence of the mandibles can not be said to do much more than merely to bear out the synthetic character of the Neuroptera as a group comprising in themselves characters common to both higher and lower Holometabola.

While the character of the mandibles would indicate that the Hymenoptera and Neuroptera are very closely related to the ancestors of the Mecoptera and other higher Holometabola, the character of the mandible of such Lepidoptera as *Sabatinca,* which is very "Orthopteroid," would indicate that the higher Holometabola were probably descended from the *ancestors* of the lower Holometabola, rather than from the lower Holometabola themselves. Many features point to the fact that the ancestors of the lower Holometabola were either the Protorthoptera, or the common Protorthopteran-Protoblattid stem from which the Protorthoptera themselves were descended. In their general features, the lower Holometabola have departed less than the higher Holometabola have, from this common ancestry, and although in certain isolated cases, such as that of the mandible of the Lepidopteran mentioned above, the higher Holometabola may retain some rather primitive features, they represent, in general, higher degrees of specialization than the lower Holometabola do, and one would expect to find in the lower Holometabola, adumbrations of tendencies which subsequently find opportunity for further development in the higher Holometabola. That such is indeed the case, is shown by the mandibles of certain Neuroptera (fig. 4) in which are presaged certain evolutionary tendencies which later find opportunity for further development along these lines in such Diptera and Mecoptera as those shown in figs. 9 and 6, while other Neuroptera (fig. 1) have mandibles of a type suggesting the forerunners of those occurring in other Mecoptera (fig. 2), and even the Coleoptera (fig. 7) appear to exhibit in their mandibles certain modificational tendencies which later find opportunity for further development in those of the higher Holometabola.

From the foregoing facts we may conclude that the evidence of the mandibles would substantiate that from other sources indicating that the ancestors of the lower Holometabola gave rise to both higher and lower Holometabola. A study of the mandibles would also support the view that the Neuroptera have in many respects departed but little from the condition characteristic of the ancestors of certain higher Holometabola such as the Mecoptera, Diptera, etc., and the evidence of the mandibular structures is also in harmony with the view that the Hymenoptera and Coleoptera are quite closely related, among the lower Holometabola.

Bibliography.

Crampton, 1921. Head and Mouthparts of Insects. Ann. Ent. Soc. America, XIV, p. 65.

—— 1922. Wings of Insects. Can. Ent. LIX, p. 206.

—— 1923a. Maxillae of Insects. Jour. N. Y. Ent. Soc., XXI, p. 77.

—— 1923b. Labium of Holometabola. Proc. Ent. Soc. Washington, 25, p. 171.

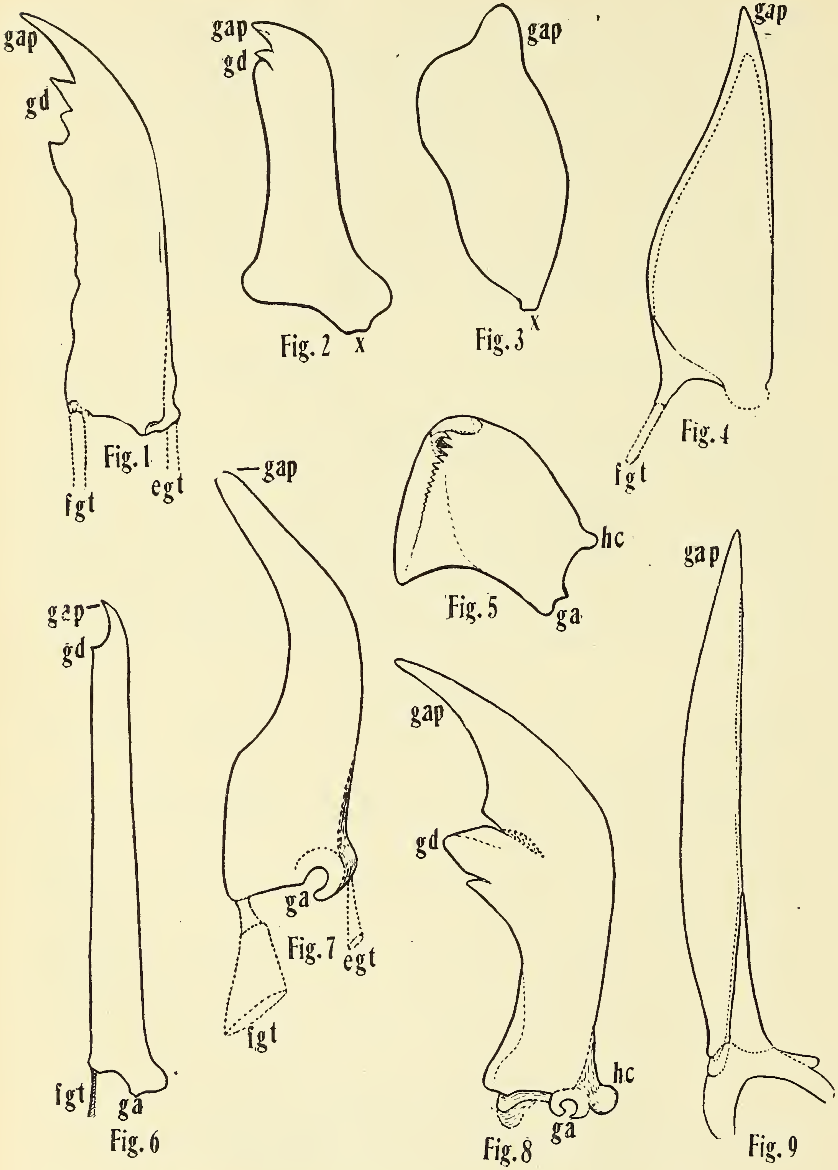
—— 1924. Grouping of Insect Orders. Pomona, Jour. Ent. Zool., 1924, p. 33.

Tillyard, 1919. The Panorpoid Complex. Proc. Linn. Soc. N. S. W., XLIV, p. 533.

Abbreviations.

egt—Extensor gnathotendon, or mandibular tendon to which is attached the muscle opening the mandible.

fgt—Flexor gnathotendon, or mandibular tendon to which is attached the muscle closing the mandible.


gap
gd
Fig. 1
fgt
egt
gap
gd
Fig. 2
x
gap
Fig. 3
x
gap
Fig. 4
fgt
hc
Fig. 5
ga
gap
gap
gd
fgt
ga
Fig. 6
gap
ga
Fig. 7
egt
fgt
gap
gd
hc
ga
Fig. 8
gap
Fig. 9

Mandibles of Holometabolous Insects.

ga—Gnathacetabulum, or mandibular acetabulum articulating with a process at the postero-lateral angle of the clypeus.
gap—Gnathapex, or apex of mandible.
gd—Gnathodentes, or mandibular teeth.
hc—Hypocondyle, or condyle articulating with an acetabulum on the hypostomal region of the head.

EXPLANATION OF PLATE.

All figures depict anterior (dorsal) views of the insect's right mandible.

Fig. 1. *Corydalis cornutus* (Neuropteran).
Fig. 2. *Panorpodes* sp. (Mecopteran).
Fig. 3. *Macronema* sp. (Trichopteran).
Fig. 4. *Nemoptera sinuata* (Neuropteran).
Fig. 5. *Sabatinca* sp. (Lepidoptera).
Fig. 6. *Bittacus* sp. (Mecopteran).
Fig. 7. *Rhipiphorus dimidiatus* (Coleopteran).
Fig. 8. *Sphex* sp. (Hymenopteran).
Fig. 9. *Tabanus* sp. (Dipteran).

Collecting Notes.—Two female specimens of *Atrytonopsis hianna* Scudder were taken by the writer at Oakdale, Suffolk County, Long Island, N. Y., on June 22, 1924, on the flowers of the running blackberry. The only other Long Island specimen collected by the writer was taken at Central Park, Nassau County, on May 29, 1921, as recorded in this BULLETIN, xvii, no. 5, p. 152. This specimen was a male and was taken on the flowers of red clover. The species is not at all common on Long Island and appears to occur in localities bordering on the pine-barren region, during late May and June.—E. L. BELL, Flushing, N. Y.

A NEW NORTH AMERICAN SPECIES OF MICROVELIA (Hem.).[1]

By Roland F. Hussey, New York City.

Microvelia gerhardi sp. nov.

Fusiform, plumbeous black, covered with minute sparse yellow pile, and provided with longer silvery hairs which form small shining areas as follows: on the sides of the head, a very narrow line along the inner margin of the eyes, sides of the anterior pronotal lobe, several small maculae on the dorsal surface of the posterior pronotal lobe and the mesonotum, the third dorsal segment of the abdomen entirely, the sides of the first, second, fifth, sixth, and seventh, and a narrow median longitudinal line on the fourth abdominal segment; anterior pronotal lobe with an orange band, scarcely interrupted at the middle. Beneath plumbeous; bucculae, gula, anterior margin of the prostethium and apical margins of all the acetabula flavous; connexivum above and below broadly margined with testaceous, the incisures black; middle of the apical ventral segments testaceous; sides of the venter and the thorax below with silvery hairs which are most numerous on the metastethium and the first ventral segment. Antennae dark testaceous, basal half of the first segment yellow, the fourth segment black; rostrum testaceous, the base and the apical segment piceous. Legs testaceous, femora infuscated above, tibiae and tarsi testaceo-piceous.

Head about one-fourth shorter than its width, including the eyes (25:32), somewhat tumidly convex between the eyes; ratios of lengths of antennal segments, I : II : III : IV = 36 : 31 : 37 : 41, the disparity in thickness between segments II and III much less obvious than in *M. americana,* antennae one-fourth longer than the combined length of head and thorax. Thorax 2/5 longer than the head, its greatest width 3/5 greater than its median length, gradually narrowed anteriorly, the sides not at all or only very slightly sinuate at the suture between prothorax and mesothorax; pronotum divided into two lobes by a straight (or very feebly sinuate) transverse impression, the semi-elliptical posterior lobe 3/5 longer than the anterior; metanotal triangles very strongly transverse, occupying about one-fourth of the total width of the thorax, two and one-half times as wide as long, their apices very acute, their posterior margins very lightly sinuate. Anterior femora 2/9 shorter than the intermediate ones, these 1/6 shorter than the posterior femore. Connexivum almost vertical in the specimens before me.

---

[1] Contribution from the Biology Department of the Washington Square College, New York University.

Alate form unknown to me, but probably that described by Uhler under the name *Microvelia americana* in the "Hemiptera of Colorado," page 61 (1895).

Length 3.3 mm., humeral width 1.3 mm.

Localities: COLORADO, Golden, 23. VII. 1909 (W. J. Gerhard). Type in my collection; Nebraska: Glen, Sioux Co., Aug., 1903 (H. G. Barber).

This species is very similar to *M. americana* Uhler of the eastern United States, first described as a species of Hebrus; and it has certainly been confused with that form, even by Uhler himself, as suggested above. *M. gerhardi* differs from *M. americana,* however, in numerous characters; it is larger, the head and thorax are longer, the lateral margins of the thorax are less sinuate, the posterior pronotal lobe is longer, and the antennae are otherwise constructed. To facilitate comparison, some of the distinguishing characters of the eastern species are summarized below.

Microvelia americana Uhler. Ratios of lengths of antennal segments, I : II : III : IV = 31 : 20 : 32 : 43, antennae somewhat more than one-fourth longer than head and thorax combined (126 : 97) : head one-third shorter than its width including the eyes; thorax of the apterous form twice as wide as it is long, posterior pronotal lobe one-fourth longer than the anterior lobe; metanotal triangles less acute at their apices than in *M. gerhardi*; anterior femora almost one-sixth shorter than the intermediate ones, these about one-twelfth shorter than the posterior femora.

A Change of Name. (Hemiptera, Miridae).—In 1922 (Psyche, xxix, p. 230; issued January, 1923) I redescribed *Orthotylus delicatus* Cook, a species whose original description had been entirely overlooked before. It appears to be the consensus of opinion that this name, written *Orthotylus* (*Psallus*) *delicatus* by Cook in 1893, is preoccupied by *Psallus delicatus* Uhler, 1887. Therefore I propose the name **Orthotylus althaeae**, nom. nov., for Cook's species.—R. F. Hussey, New York, N. Y.

A REVISION OF THE GENUS BASILARCHIA
(Rhopalocera: Nymphalidae).

By Waro Nakahara, New York City.

This study arose as an examination of the male genitalia of *Basilarchia arthemis* and *B. astyanax* in an effort to determine if constant structural differences exist between these two so-called species. Incidentally, observations have been extended to all the known species and subspecies of the genus *Basilarchia.* Color forms and aberrations have not been studied genitalically, but they are listed in this paper merely for the sake of completeness. Only that part of bibliography which may prove of interest is given.

For the study of the evolution of " species," the genus *Basilarchia* furnishes an excellent material. I refer especially to the phylogenetic relationship of our common *arthemis, astyanax* and *archippus.* These three forms apparently have evolved from a common parent stock rather recently, as might be judged from the occurrence of intermediate forms, yet, there are reasons to believe, as it will be developed later in this paper, that *archippus* has already become a separate species, while the remaining two have not yet reached that degree of segregation which is worthy of specific distinction. The logical treatment of these forms, representing as they do various degrees of phylogenetic affinity, presents an interesting problem in philosophical taxonomy.

I am greatly indebted in this study to Dr. William Barnes, of Decatur, Ill., for a magnificent gift of specimens. I am under deep obligation to M. Charles Oberthür, of Rennes, France, for his kindness in comparing my specimens with Boisduval's types of *B. lorquini.* My thanks are also due to Messrs. Jacob Doll and George Engelhardt, of the Brooklyn Museum, New York, and to Mr. Frank E. Watson, of the American Museum of Natural History, New York, for certain biological data and for information on larvae of our Northeastern species; to Mr. D. M. Bates, of the Agricultural Experiment Station, Gainesville, Fla., for a series of *B. archippus floridensis*; to Captain N. D. Riley, of the British Museum, for information concerning Drury's and Fabricius's types. Finally, I express my lasting appreciation to Mr. Foster H. Benjamin, of the Barnes Collection, Decatur, Ill., for his constant encouragement, friendly advice and help, without which the completion of this work would have been impossible.

Genus BASILARCHIA Scudder.

Callianira Hübner, Verz. Bek. Schmett., p. 38, 1818 (preoccupied in Mollusca). Sole species and therefore type: *C. ephestiaena* Hbn.

Basilarchia Scudder, Fourth Rep. Peab. Acad. Sci., p. 29, 1872. Type: *Callianira ephestiaena* Hbn.

Without going into finer anatomical details, it may be said that all the species of the genus agree very closely as to the appearance of the penis. This organ tapers very gradually into a more or less dull point, and is covered with evenly distributed, minute spines. The spines become smaller and more like hairs toward the base of the penis. The uncus likewise offers little assistance in distinguishing species, for the differences that can be detected in this organ are very slight and comparative. Generally speaking, the uncus very gradually tapers into a sharp point in *arthemis, weidemeyerii,* and *lorquini.* In *archippus* and *obsoleta,* however, the uncus appears in the lateral view to be slightly constricted near the base and gradually dilated again before ending in a sharp point.

All the species can be most readily recognized by the structure of the valve, as follows:

KEY TO THE SPECIES OF BASILARCHIA.

A. The apex of the valve not produced into a conspicuous prolongation.
  a. The distal portion of valve narrow and the apex almost subacute .... *arthemis.*
  b. The distal portion of valve very broad and the apex very full and rounded .... *weidemeyerii.*
B. The apex of the valve produced into a conspicuous prolongation.
  a. The prolongation straight, very slender and sharply pointed: needle-like .... *lorquini.*
  b. The prolongation straight, thick and blunt ..... *obsoleta.*
  c. The prolongation strongly hooked .... *archippus.*

Basilarchia arthemis arthemis (Drury). (Fig. 1.)

Nym. Phal. arthemis Dru., Ill. Exot. Ent., vol. II, pl. X, fig. 3, 1773.

Limenitis arthemis Edwards, Butt. N. Amer., vol. II, p. 202, pl. XXXVI, fig. 1–4, 1879.

Basilarchia arthemis Scudder, Butt. East. U. S., vol. I, p. 294, pl. II, fig. 5, 1879; Holland, Butt. Book, p. 184, pl. XXII, fig. 4, 1898; Field, Psyche, vol. XI, p. I, pl. I, fig. 5; pl. II, fig. 4, 1904; Barnes and McDunnough, Cont. Nat. Hist. Lepid. N. Amer., vol. III, p. 101, 1916.

Papilio lamina Fabricius, Ent. Syst., vol. III, p. 118, 1793.

Genitalically, *B. arthemis* can be told by the relatively slender distal portion of the valve furnished with spiny projections, some seven in number, of intergrading lengths. Viewed from the side, these projections are distributed somewhat evenly over the entire margin of the terminal portion of the valve. The typical race of the species, subsp. *arthemis,* is characterized by the fact that the dorsal margin of the valve, at about the middle, curves sharply downward toward the apex. This is a small sized northern race, occurring as far south as the mountainous sections of central New York.

There is a possibility that the true *arthemis* and *albofasciata* are one and the same race, but without an accurate comparison of the types it is not possible to arrive at a logical conclusion. Drury's *arthemis* was described as having been received from New York, which at that time most likely meant the vicinity of New York City. It may be recalled that New York State was then a wilderness, with the exception of Dutch colonies along the Hudson. This consideration favors the idea that *albofasciata* may be a straight synonym of *arthemis,* in which case the smaller race inhabiting northern territories now called *arthemis* would prove to be nameless. However, Drury's specimens might have come from the Catskills, and really represented the northern race. Drury gives the expanse of female as 2⅝ inches. Since this measurement was most likely taken from a specimen spread in " English " fashion, it might be considered to point to the northern race. He also notes the series of " brown orange spots " to the upperside of hindwing. This character is much more constantly found in the northern race than in *albofasciata.*

Captain N. D. Riley, of the British Museum, has kindly informed me that " Drury's collection was sold at auction after his death and it is quite impossible now to trace his specimens."

Fabricius's *lamina* is tentatively listed as a synonym of *arthemis,* although it is quite possible that it may be the same as *albofasciata* and take priority over the latter. *Lamina* was inadequately described from a specimen in Jones Collection, of which it is stated that " habitat in Indiis." In spite of the fact that

Butler mentions this name in his "Cat. Diurn. Lepid. described by Fabricius in the coll. of British Museum," the type of *lamina* is not to be found in the Museum (Capt. N. D. Riley).

Aberr. **rufescens** (Cockerell).

Limenitis arthemis f. *rufescens* Ckll., Ent. vol. XXII, p. 4, 1889.

This aberration is unknown to me, and also probably to its describer, being simply a name given to the form mentioned by Maynard (Butt. New England, p. 11, 1886): "occasionally the ground color is reddish brown even above."

Aberr. **arthechippus** Scudder.

Basilarchia arthemis-archippus hyb. *arthechippus* Scud., Butt. East. U. S., I, p. 296, 1889.

I tentatively place this as an aberration of *arthemis* in absence of proof that it is a hybrid. This might be a form parallel to aberr. *rubidus* Stkr. of subsp. *astyanax,* and might well represent a reversion toward an ancestral type of coloration. No specimen before me. Habitat: Northern United States and Southern Canada.

Basilarchia arthemis rubrofasciata Barnes and McDunnough. (Fig. 2.)

Basilarchia arthemis subsp. *rubrofasciata* B. and McD., Can. Ent., vol. XLVII, p. 221, 1916.

Basilarchia arthemis race *rubrofasciata* B. and McD., Cont. Nat. Hist. Lepid. N. Amer., vol. III, pl. IX, fig. 7, 1916.

This subspecies can scarcely be distinguished from the preceding one in genitalic characters. I have a single male from Miniota, Manitoba, determined by Barnes and Benjamin. This specimen resembles subsp. *arthemis* very closely, but the submarginal series of red spots on the underside of wings run together and form a band. This is the northernmost race, which replaces subsp. *arthemis* in Canada toward the north. Habitat: Canada.

Basilarchia arthemis proserpina (Edwards). Fig. 3.

Limenitis proserpina Edw., Proc. Ent. Soc. Phil., vol. V, p. 148, 1865; Edw., Butt. N. Amer., vol. VIII, p. 127, 1869.

Limenitis arthemis f. *proserpina* Edw., Butt. N. Amer., vol. II, p. 203, pl. XXXVI, figs. 5, 6, 1889.

Basilarchia arthemis f. *proserpina* Scudder, Butt. East. U. S., vol. I, p. 289, pl. II, fig. 9, 1889.

In this subspecies, the downward curve of the dorsal margin of the valve is not so precipitous as in subsp. *arthemis,* although I doubt if this character is constant. Colorationally, it has the traces of the white band of subsp. *arthemis* faintly represented, usually including a short white streak on the costa of forewing. There are as a rule the usual series of red spots on the upper side of wings, but these may be entirely absent or present only in forewing.

Proserpina has long been considered as a form of *arthemis,* but Mr. Benjamin suggested (personal communication) that it is more natural to regard it as a race because of its constant occurrence in the Catskill Mountain region of New York. I tentatively subscribe to this view, especially on the basis of my genitalic finding. It may be noted, however, that even in the territory here indicated, *proserpina* is more apt to be an accompaniment of the typical form of subsp. *arthemis,* rather than itself being the principal representative of the species. Habitat: Catskill Mts., New York.

Basilarchia arthemis albofasciata (Newcomb).

Limenitis ursula var. *albofasciata* Newc., Psyche, vol. XIV, p. 20, pl. III, fig. 6, 1907.

Basilarchia astyanax form *albofasciata* Barnes and McDunnough, Cont. Nat. Hist. Lepid. N. Amer., vol. III, p. 102, 1916.

I place this as a race intermediate between subsp. *arthemis* and subsp. *astyanax,* rather than as a form of the latter. It is often an accompaniment of *astyanax* in its northern half of the range, and without doubt they interbreed. From this *albofasciata* may be regarded as a color form of *astyanax.* On the other hand, I believe that further north of the *astyanax*-zone, there are territories where *albofasciata* occurs as the principal type of the species *arthemis.* For example, at Ithaca, N. Y., I have not seen a single specimen of *astyanax,* in spite of the fair number in which *albofasciata* occurs there. Some of the Ithaca specimens are small, simulating subsp. *arthemis,* but these small specimens are usually narrow-banded. There is no doubt that *albofasciata* merges into *arthemis* in its southern range, as the former run into *astyanax* in its northern territory. It may be said that *albofasciata* is an intermediate race, occupying the intermediate territory, and showing the markings of subsp. *arthemis* and the size of subsp. *astyanax* combined. The white band is usually narrower than in subsp. *arthemis,* but in some specimens it may be as wide, or even wider. The red spots on the upper side of wings may be totally absent. Genitalically, no difference has been found between this and subsp. *arthemis.*

Aberr. **benjamini,** ab. nov.

Upperside: a white bar on the costal margin of forewing, and a series of white spots extending from the middle of the fifth interspace down to the hind margin near the hind angle; a series of white macules also in hindwing, following internally the submarginal series of red spots. The position of these white spots suggests that they are the remains of the external portion of the usual white band. The white band is better preserved on the underside and it appears more as in the typical *albofasciata,* though considerably narrower and ill-defined on its inner border. Other markings are as in the typical form of subsp. *arthemis.*

Holotype: ♀, Massachusetts. Type in the Barnes Collection. This aberration may be of interest as a connecting link between subsp. *albofasciata* and subsp. *astyanax.* It is very much like the specimen shown in Holland's Butterfly Book erroneously as form *proserpina,* with which it may be confused by collectors. *Proserpina,* however, is a much smaller butterfly, and has the white markings a good deal more reduced. Habitat: Central and Southern New York; Northern Pennsylvania; Massachusetts; Connecticut.

Basilarchia arthemis astyanax (Fabricius). (Fig. 4.)

Papilio astyanax Fab., Syst. Ent., p. 447, 1775.

Basilarchia astyanax Scudder, Butt. East. U. S., vol. I, p. 280, pl. II, fig. 8, 1889; Holland, Butt. Book, p. 183, pl. XXII, fig. 1, 1898.

Papilio ephestion Stoll, Suppl. Cramer Pap. Exot., p. 121, pl. XXV, fig. 1, 1790.

Papilio ursula Fab., Ent. Syst., vol. III, p. 82, 1793.

Callianira ephestiaena Hübn., Verz. bek. Schmett., p. 38, 1818.

In this subspecies, the downward curve of the dorsal margin of valve is gradual, and thus differs slightly from subsp. *arthemis.*

The larvae and pupae of *B. arthemis arthemis* and *B. arthemis astyanax* are said to be slightly different by Scudder (*l. c.,* p. 280 and 294) *et al.* According to Mr. F. E. Watson (personal communication), the chief larval differences are in the long tubercle, which in *arthemis* is conspicuously clubbed and short, with short and conical spiny warts, while in *astyanax* it is not clubbed, with slender spiny warts. It is not known whether these differences are constant and show no intergradations. *A priori,* it is rather to be expected that the larva of typical *arthemis* and that of typical *astyanax* should differ from each other somewhat, for these two are slightly different structurally in the adult stage.

My reason for considering *astyanax* as a subspecies of *arthemis,* in spite of the larval differences, is as follows: Of all the so-called species of the genus *Basilarchia, arthemis* and *astyanax* are the only ones that show no clean-cut genitallic differences, the difference being very gradual and intergrading. Again, these are the only " species " that show intermediate forms regularly. The degree of isolation, both morphological and biological, between *arthemis* and *asytanax* is very much smaller than that between any other two species of the genus. Therefore to give a specific status to *astyanax* and to arrange it in juxtaposition with other much more sharply differentiated species is to commit an apparent taxonomic error.

The classical work of Field (Psyche, vol. XXI, p. 116, 1914) has already proved the great intimacy of phylogenetic relationship between *arthemis* and *astyanax* by producing experimental hybrids between them. Mr. Engelhardt, moreover, kindly informed me of the interesting experience of Mr. Doll, who has obtained in breeding *astyanax* in Brooklyn, N. Y., series of forms clearly indicating a close relationship to *arthemis,* including those that can not be distinguished from specimens of true *arthemis* from northern territories. Biological evidences like these outweigh any purely morphological facts in establishing the real closeness of the blood relationship, and they can only be explained under the theory that we are here dealing with forms that have segregated so recently that they have not yet become stable, or, in other words, have not become separate species.

The regular occurrence of intermediate forms between the typical form of subsp. *arthemis* and of subsp. *astyanax* has already been referred to. I have dealt with these intergradations in this paper as follows:

Subsp. *arthemis:* small in size, with a broad white band, and a series of red spots on the upperside of both wings.

Subsp. *proserpina:* size similiar to *arthemis,* with faint traces of parts of the white band, and usually with red spots on the upperside of both wings.

Subsp. *albofasciata:* larger in size, usually with slightly narrower white band than subsp. *arthemis*; with or without the red spots.
Aberr. *benjamini:* with the white band broken up into a series of white spots; size similar to typical *albofasciata.*
Form *atlantis:* the white band completely disappeared, but with a series of red spots on the upper side of hindwing.
Subsp. *astyanax:* The white band as well as the red spots of hindwing totally absent.

It may be seen from the above that the series of the connecting links between the two subspecies is completely established.

Forms included in subsp. *astyanax* are as follows:

Form **viridis** (Strecker).

Limenitis ephestion var. *viridis* Stkr., Syst. Cat. N. Amer. Lepid., p. 1444, 1878.

This is a common form in which the usual bluish markings are replaced by greenish.

Form **atlantis** Nakahara.

Basilarchia astyanax ab. *atlantis* Nakahara, Ent. News, vol. XXXIV, p. 10, 1923.

In this form a complete series of red spots is shown on the upperside of hindwing. It thus resembles certain forms of subsp. *proserpina,* but the size is larger, and there is no trace of the white band. The holotype of this aberration has been presented to the Barnes Collection. Since then I have examined another specimen from Long Island.

Aberr. **rubidus** (Strecker).

Limenitis ephestion ab. *rubidus* Stkr., Syst. N. Amer. Lepid., p. 1444, 1878.

This form is apparently intermediate between *B. arthemis astyanax* and *B. archippus archippus* in the coloration. There is no specimen before me.

Aberr. **cerulea** (Ehrmann).

Limenitis ursula var. *cerulea* Ehrm., Can. Ent., vol. XXXIII, p. 348, 1900.

This aberration is unknown to me. Described as having large bluish spots on upperside of wings similar to the white spots of *arthemis.*

Form **inornata**, forma nov.

Differs from the typical *astyanax* by the total absence of the red spots on the upperside of forewing, thus resembling subsp. *arizonensis* Edw.; the inner series of the submarginal lunules of hind wing larger than, and not whitish as in *arizonensis*; the veins crossing the postdiscal macular band not so broadly marked with black as in the subspecies; the red spots on the underside somewhat brighter; also, the shape of wings is that of *astyanax*.

Holotype: ♂, Glendale, L. I., N. Y.; Allotype: ♀; Paratopotype: ♂; Paratypes: ♂, Elmhurst, L. I., 2 ♂'s, Richmond Hill, L. I., ♂, Flushing, L. I., ♀, Aqueduct, L. I. Three paratypes (Elmhurst, Richmond Hill, and Flushing) in the collection of the writer. All other types in the Barnes Collection.

It should be mentioned that two of the paratypes (Flushing and Aqueduct) are marked with greenish as in form *viridis,* while all the other types are of the ordinary blue form. It is my intention to include under the name of *inornata,* specimens that show no red spot on the upper side of fore and hind wings, regardless of whether it is a blue or green form.

This new form may be of interest as a connecting link between subspp. *astyanax* and *arizonensis.*

Habitat: Eastern United States to Nebraska.

Basilarchia arthemis arizonensis (Edwards). Fig. 5.

Limenitis ursula var. *arizonensis* Edw., Pap., vol. II, p. 22, 1882.

In this subspecies the downward curve of the dorsal margin of the valve is very slight. Apparently a common butterfly in Southern Arizona. I have a large series of specimens determined by Barnes and Benjamin, sent to me from the Barnes Collection. Habitat: Southern Arizona.

Basilarchia weidemeyerii weidemeyerii (Edwards). (Fig. 6).

Limenitis weidemeyerii Edw., Proc. Acad. Nat. Sci. Phil., p. 162, 1861; Edw., Butt. N. Amer., vol. I, p. 129, pl. XLII, 1869; Wright, Butt. West Coast, p. 179, pl. XXIII, fig. 237, 1905.

Basilarchia weidemeyerii Holland, Butt. Book, p. 185, pl. XXII, fig. 6, 1898.

The valve is very lateral, and the distal portion of it is exceedingly broad with full and well rounded apex. Several short spiny projections are arranged in a somewhat straight line on the apical margin. Habitat: Colorado, Utah.

Basilarchia weidemeyerii nevadae Barnes et Benjamin.

Basilarchia weidemeyerii race *nevadae* B. et B., Cont. Nat. Hist. Lepid. N. Amer., vol. V, p. 99, 1924.

One paratype, from Charlestown Mts., Southern Nevada, and another specimen, from Las Vegas, Nev., have been sent to me from the Barnes Collection. These are as narrowly banded as the following subspecies, *B. sinefascia* f. *angustifascia,* but the red and orange red spots on the underside of wings are all dull brown. This race cannot be distinguished by genitalic characters. Habitat: Charlestown Mts., Clark Co., Southern Nevada.

Basilarchia weidemeyerii sinefascia (Edwards).

Limenitis weidemeyerii ab. *sinefascia* Edw., Pap., vol. II, p. 22, 1882.

Basilarchia weidemeyerii sinefascia Barnes and Benjamin, Cont. Nat. Hist. Lepid. N. Amer., vol. V, p. 99, 1924.

Sinefascia is an aberration of the Arizona race of *weidemeyerii,* which has been named *angustifascia* by Barnes and McDunnough. In order to comply with the International Rules, Barnes and Benjamin (*loc. cit.*) list the Arizona race as *B. weidemeyerii sinefascia,* distinguishing the normal form of the race as *B. weidemeyerii sinefascia* from normal *angustifascia* B. et McD.

Form **angustifascia** Barnes et McDunnough.

Basilarchia weidemeyerii race *angustifascia* B. and McD., Can. Ent., vol. XLIV, p. 163, 1912.

This subspecies does not differ genitalically from the two preceding subspecies. I have a single specimen from the White Mts., Arizona (topotypical), determined by Barnes and Benjamin. Habitat: Arizona.

Basilarchia lorquini lorquini (Boisduval). (Fig. 7.)

Limenitis lorquini Boisd., Ann. Soc. Ent. France, vol. X, p. 301, 1852; Edwards, Butt. N. Amer., vol. I, p. 131, pl. XLIII, 1870.

The valve ends in a slender sharply pointed projection, with an additional small pointed projection dorsad the base of the conspicuous main one.

This subspecies was originally described from "California," and four specimens of the type series of Boisduval are now in the collection of M. Charles Oberthür. Through the kindness of M. Oberthür, a lot of specimens from different parts of California have been compared with these types. M. Oberthür returned to me two specimens as agreeing best with the types, and these turned out to be southern California specimens. The two specimens compared with the types are now in the Barnes Collection.

In specimens from Middle California northward, through the mountainous parts of California and of Nevada, the white band across the wings is narrow; on the underside of hindwing, the entire anal area is whitish, and the whitish spots near the base of the wing are very distinct. These may be allowed to stand, at least for the present, as intermediate forms between subsp. *lorquini* and subsp. *burrisoni.* If the northern California and Nevada form should be established as a race, it would become necessary to apply the following aberrational name to that race.

Aberr. **eavesii** (Edwards).

Limenitis lorquini var. *eavesii* Edw., Pac. Coast Lepid., p. 9, 1877.

In this aberration, there is a postmedian series of fulvous spots on the upperside of hindwing. I have two specimens that exhibit this character: one from Plumas Co. and the other from Warner Mts., Modoc Co., of California. With the exception of the fulvous spots just mentioned, they agree well with the common form of northern California, with narrow white band. Habitat: California; Nevada; Oregon.

Basilarchia lorquini burrisoni (Maynard).

Limenitis lorquini form *burrisoni* Mayn., Man. N. Amer. Butt., p. 102, 1891.

Basilarchia lorquini race *burrisoni* Barnes and McDunnough, Cont. Nat. Hist. Lepid. N. Amer., vol. III, p. 102, 1916.

There is nothing characteristic about the genitalia of this subspecies. This is the northern race with the greatly reduced apical fulvous patch, and with very dark underside. Habitat: British Columbia, including Vancouver Island; Idaho; Washington; Montana.

Basilarchia archippus archippus (Cramer). (Fig. 8).

Papilio archippus Cram., Pap. Exot., vol. I, p. 24, pl. XVI, fig. A, 1775.

Basilarchia archippus Scudder, Butt. East. U. S., vol. I, p. 267, pl. I, fig. 5, 1889.

Nymphalis disippe Godart, Enc. Method., vol. IX, p. 393, 1823.

Basilarchia disippus Holland, Butt. Book, p. 185, pl. VII, fig. 4, 1898.

Papilio misippus Fabricius, Syst. Ent., p. 481, 1775 (nec Linneus).

The end of the valve produced into a strongly curved hook, with one or two small projections and a series of some four or five projections of varying lengths ventrad and dorsad, respectievly, the base of the large prolongation.

B. archippus and *B. obsoleta* are genitalically rather markedly different from other *Basilarchias.* Their peculiar hook-like structure on the valve and the dilated uncus previously referred to are quite striking. On the other hand, there are some reasons to believe that at least *archippus* and *arthemis* arose from a common *Basilarchia* ancestor in a not very long past. An aberrant form of *B. arthemis astyanax* known as ab. *rubidus,* for example, is to all appearances intermediate between *archippus* and *astyanax.* Mr. Benjamin, after examining two specimens of this interesting aberrant form, concludes that it is possibly an expression of a tendency to reversion toward an ancestral form, which he considers may be something not dissimilar to *archippus.* Because of the apparent intermediate coloration, an aberrant form like this has ben considered as a hybrid between *archippus* and *astyanax* by some writers, and as a matter of fact an *archippus* × *astyanax* hybrid, not unlike the form in question has been obtained artificially by Field (Psyche, vol. XI, p. 4; vol. XVII, p. 87; vol. XXI, p. 116).

However, such an aberration, or hybrid, is of very rare occurrence, and it is safe to say that intermediate forms are not produced in nature *as a rule* between *archippus* and *astyanax.* It is rational, then, to believe that *archippus,* with its characteristic genitalic structures, is a distinct species.

The larva of *B. archippus* is very close to that of *B. arthemis astyanax,* but according to Mr. Watson, it has the long tubercles much more thickly covered with long conical spiny warts.

Aberr. **pseudodorippus** (Strecker).

Limenitis misippus ab. *pseudodorippus* Stkr., Syst. Cat. Lepid. N. Amer., p. 143, 1878.

I have no specimen before me. Mr. Benjamin examined the female type from Holyoke, Massachusetts, listed by Strecker, and remarked that it is " well described by Strecker except that the mesial black band of the hind wing is not absolutely missing, but is faintly indicated" (personal communication).

Aberr. **lanthanis** Cook et Watson.

Basilarchia archippus var. *lanthanis* Cook and Watson, Can. Ent., vol. XLI, p. 77, pl. V, 1909.

A single male specimen, apparently referable to this aberration, has been collected by the writer at Ithaca, N. Y., on August 27, 1923. In this specimen the postdiscal black belt of the hind wing is not completely gone but is represented by a very faint trace of it.

Aberr. **advena** (Ellsworth).

Limenitis archippus var. *advena* Ellsw., The Lepid., vol. II, p. 22, 1918.

Basilarchia misippus ab. *cayuga* Nakahara, Ent. News, vol. XXXIV, p. 10, 1923.

Basilarchia archippus ab. *advena* Barnes and Benjamin, The Lepid., p. 29, 1923.

The holotype of *cayuga* has been deposited in the Barnes Collection. Barnes and Benjamin (*loc. cit.*) compared it with the type of *advena* and noted a close agreement between them. Habitat: United States: Nova Scotia to British Columbia.

Basilarchia archippus floridensis (Strecker). (Fig. 9.)

Limenitis misippus var. *floridensis* Stkr., Syst. Cat. Lepid. N. Amer., p. 143, 1878.

Limenitis eros Edwards, Can. Ent., vol. XII, p. 246.

This subspecies has the large hook-like prolongation as *B. archippus archippus,* but has none of the small spiny projections found in the latter subspecies.

Mr. Benjamin, who has recently examined Strecker's types has kindly informed me that " the type of *floridensis* is a little paler than the average conception of the race; *nig* is a darker specimen of the same thing" (see below). " Edwards's figures of *eros* are somewhat intermediate, but a third name in this subspecies is of but little value, and we place it as *floridensis,* with which it agrees best."

Form **nig** (Strecker).

Limenitis misippus ab. *nig* Stkr., Syst. Cat. Lepid. N. Amer., p. 143, 1878.

Limenitis misippus var. *floridensis* ab. *nigricans* Stkr., Lepid. Rhop. Heter., Suppl., vol. III, p. 24, 1900.

An especially dark colored specimen, among others, has been received from Gainesville, Fla., through the kindness of Mr. D. M. Bates. This specimen shows a faint trace of white crescents on the inner border of the postdiscal black belt of hindwing, upperside. It is highly probable that in future an aberrant form similar to *advena* in subsp. *archippus* may be found in *floridensis*.

Aberr. **halli** Watson and Comstock.

Basilarchia floridensis ab. *halli* Wats. and Comst., Bull. Amer. Mus. Nat. Hist., vol. XLII, p. 449, 1920.

This is an aberration analogous to ab. *lanthanis* of the preceding subspecies. No specimen before me. Habitat: Florida, Georgia, Mississippi.

Basilarchia obsoleta (Edwards). (Fig. 10.)

Limenitis eros var. *obsoleta* Edw., Pap., vol. II, p. 22, 1882.

Limenitis obsoleta Wright, Butt. West Coast, p. 180, pl. XXIII, fig. 239, 1905.

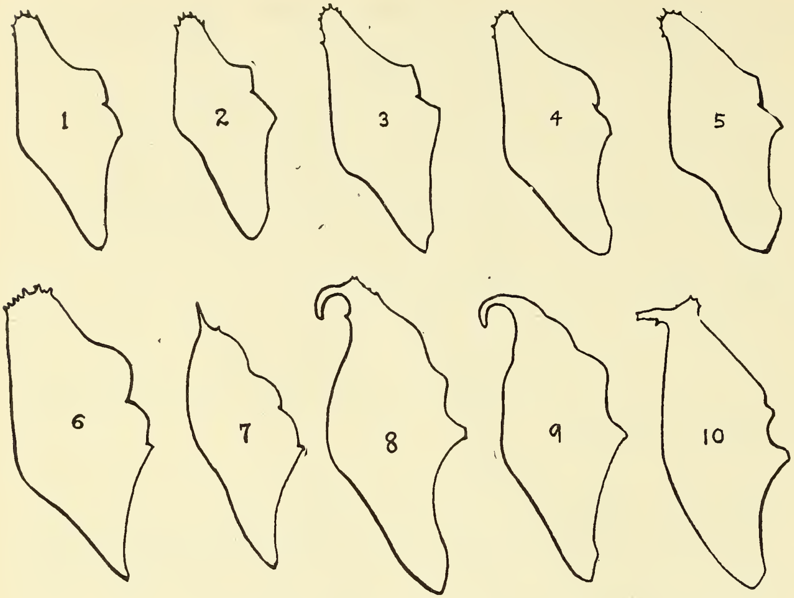
Limenitis hulsti Edw., Pap., vol. II, p. 46, 1882.

Basilarchia hulsti Holland, Butt. Book, p. 185, pl. VII, fig. 5, 1898.

In this synonymy I simply follow the literature.

The valve of this species is very similar to that of *B. archippus* but the large prolongation is shorter and is straight. There is an additional large, though short, projection dorsad the longer one, and the two together give the valve a bifurcate appearance. Habitat: Arizona; Utah.

Since writing the foregoing, through the kindness of Dr. W. T. M. Forbes, of Cornell University, Ithaca, N. Y., I have learned that *B. arthemis* subsp. *astyanax* has never been caught in the vicinity of Ithaca. *Proserpina,* however, occurs there, though very rarely, as evidenced by a few specimens in the Cornell University Collection. This shows that *albofasciata* can occur entirely separately from *astyanax.* On the other hand, the occurrence of *proserpina* in this locality suggests that the affinity between *albofasciata* and *arthemis* is a very close one, and in fact some of the smaller specimens from Ithaca might as well be called *arthemis.* All these facts tend to justify the proposed racial status of *albofasciata,* inasmuch as this form does occur in some localities as the principal type of the species.



Explanation of Figures.

All the figures represent lateral aspect of the valve of the male.

1. *Basilarchia arthemis arthemis* (Drury).
2. *Basilarchia arthemis rubrofasciata* Barnes et McDunnough.
3. *Basilarchia arthemis proserpina* (Edwards).
4. *Basilarchia arthemis astyanax* (Fabricius).
5. *Basilarchia arthemis arizonensis* (Edwards).
6. *Basilarchia weidemeyerii weidemeyerii* (Edwards).
7. *Basilarchia lorquini lorquini* (Boisduval).
8. *Basilarchia archippus archippus* (Cramer).
9. *Basilarchia archippus floridensis* (Strecker).
10. *Basilarchia obsoleta* (Edwards).

SYSTEMATIC POSITION OF DASYGASTRAE
(Hymenoptera).

By Charles Robertson, Carlinville, Illinois.

In my "Synopsis of Anthophila," 1904, Can. Ent. 36: 40, I placed these bees among the Apygidialia. As far as I can infer from the local species, I do not think they have arisen from the other bees, but that they should be separated as one of two principal groups, Dasygastrae and Scopulipedes, with the latter divided into Apygidialia and Pygidialia.

The nest-makers of the Dasygastrae have ventral scopae, which seems to me to indicate a primitive habit and not a change from the habit of carrying pollen on the legs. They visit the same kinds of flowers as the Scopulipedes do and can collect the pollen as easily.

In the Scopulipedes the specialization of the labial palps began with the first joint, which is longer than the second, except in *Melitoma* which carries its proboscis extended under the body. When only one joint is flattened, it is the first. In the Dasygastrae the specialization began with the second joint. In *Prochelostoma philadelphi* the first joint is simple, while the second is flatened and three times as long. Of forty-eight local Dasygastrae, only six have the first joint longer than the second, and then only slightly.

THE SEVENTEEN-YEAR CICADA ON LONG ISLAND WITH PARTICULAR REFERENCE TO ITS APPEARANCE IN 1923.

By Wm. T. Davis, Staten Island, N. Y.

The writer commenced to explore entomologically the central and eastern part of Long Island, N. Y., in 1907, and one of the first things noticed in the Half Way Hollow Hills, as well as at Yaphank, and elsewhere in the years that followed, were the numerous scars on the branches of trees where the Seventeen-year Cicadas had laid their eggs in 1906. From personal observation, and other sources of information, it was discovered that the cicadas of that year, known as Brood 14, covered in a general way territory along the north shore from Oyster Bay to Wading River, extending south to Farmingdale and eastward through the central portion of the island to Manorville. There were also colonies at Moriches and Eastport.

Brood 14 is the most extended brood of 17-year cicadas on Long Island, and its reappearance above ground in 1923 was looked forward to with much interest.

On June 25 Wyandanch was visited. I walked toward the Half Way Hollow Hills and came to the road leading into the hills, and later to the farm of Mr. Holmes. It was a warm day and the cicadas were singing continuously. Many of them had died from the fungus disease, *Massospora cicadina,* and were lying on the road through the woods, while others afflicted by the disease were flying about or crawling on the ground in a dying condition. In many of the living insects the abdomen, with the terminal segments gone, was entirely empty, and by looking into it with my glass as I held it in my hand, I could see the song apparatus vibrate while the insect made a considerable noise. This was the best view I have ever had of the organs of song in action in any cicada.

Near the top of the first hill I came to an area of slender though high trees where there was, in addition to the common song of the 17-year cicada, a number of insects producing a ticking sound; a *tick-tick* or interrupted chirping song consisting of about fifteen or twenty ticks. I suspected that this song might be produced by the small form *cassinii,* but could not be sure in the rather high trees. I continued to Mr. Holmes's farm, and found him in the orchard. He said that while the cicadas would probably do some damage to his fruit trees, they had also lessened his feed bill for the keep of his many chickens. He said the difference was quite noticeable.

Continuing my walk in the orchard to its edge, and close to the woods, I was pleased to hear the *tick-tick* song in one of the apple trees. Here there was a chance to observe the insects in a rather low tree. It was not long before I observed several *cassinii* in the act of singing. There were several males on the trunk and larger branches of the apple, while the large 17-year cicadas were, for the most part, out on the smaller twigs. They were also singing and one flew on to my coat and commenced to sing. Let no one imagine that he is going to locate a colony of *cassinii* by any song bearing any resemblance to that of the large 17-year cicada. While the two forms closely resemble each other except in size, there is no resemblance in the songs. The large cicadas were singing what is to me a melodious song, rather soft, and taken together like the low hum of machinery, but the effort of *cassinii* was very different, being simply a series of ticks or chirps repeated about 15 or 20 times.

On the way back I stopped again at the larger colony of *cassinii,* and found a dead male and female on the ground. There seemed to be several hundred *cassinii* at this place. These were the only two colonies of this small cicada that I found during the day. The large form extended southward to the railroad and beyond.

During the summer I received from a number of friends[1] considerable information regarding the distribution of the cicadas, and when each locality was plotted on a map, the area already given for the appearance of the brood in 1906 was almost exactly duplicated. The region covered by Brood 14 is about forty miles from west to east, occupying in a general way the central part of the island, and extending from the north shore about ten miles southward.

Brood 1 will appear in 1927, and as far as is known, only in the Half Way Hollow Hills (see *Journal, N. Y. Entomological Soc.,* December, 1910) ; Brood 2 in 1928 in the western part of the island where it has been greatly reduced by the growing city of Brooklyn; Brood 5, in 1931, in the Half Way Hollow Hills, also in the hills north of Holbrook and at Wading River (see Bull. Brooklyn Ento. Soc., Oct., 1915); Brood 9, possibly in 1935, in the woods between Manorville and Wading River (see Bull. Brooklyn Ento. Soc., Feby., 1920), and Brood 10, in 1936, in several localities along the southerly part of the island from about Rockville Centre to Mastic, and perhaps also near Riverhead.

---

[1] Ernest L. Bell, George P. Engelhardt, Arthur H. Helme, Roy Latham, E. S. Miller, John T. Nichols, Frederick M. Schott, and Miss Clara W. Weeks.

DIABROTICA TRICINCTA SAY INJURIOUS IN NEW MEXICO.

By F. H. Chittenden, Washington, D. C.

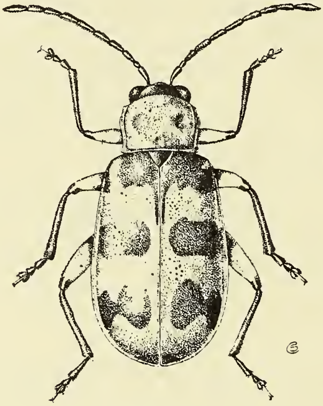


Fig. 1.

Mr. W. W. Poole, Tucumcari, New Mexico, on July 5, 1923, sent specimens of this cucumber beetle with accompanying information that it was ruining the truck patches in that vicinity, killing beans, squash, cucumber, cantaloupe, watermelons and other crops. This is the first instance of serious injury known to the writer.

The species is recorded from Colorado, Arizona and New Mexico, being evidently most abundant in the last states. Cockerell and Fall have expressed the opinion that it inhabits a vertical range of 7,200 feet in New Mexico, and it has been found at Albuquerque, Socorro, Mesilla Valley, Santa Rosa, Roswell, Rio Ruidoso, and at the top of the Las Vegas range. It also extends into Mexico, having been recorded from San Isidro.

The three fasciae or bands which ornament the elytra and from which the species derives its Latin name, distinguish it from other Diabroticas. From *D. 12-punctata* Fab., to which it is most closely related, it may be separated readily by these bands. The basal one is narrow and crosses the suture, the second and third are interrupted at the suture, and there is a small apical spot at the sutural angle of each elytron. (See fig. 1.) These bands have the appearance of having originally been spots which have in the course of evolution been merged or joined together. In fresh specimens under observation the prothorax is distinctly pale red.

Among other material received during August and early September, 1923, Mr. J. R. Douglass sent from Estancia, New Mexico, were beetles of this species found on cucumber and on the wild pumpkin, *Cucurbita foetidissima*.[1]

Dr. Robt. Middlebrook also observed this species in the eastern half of New Mexico, July 13, doing damage to cucumber, watermelon, and cantaloupe, estimating the loss approximately at 20 per cent.

In 1909, this species was observed by H. O. Marsh in company with *D. vittata* Fab., on pumpkin at Rocky Ford, Colo., and July 9, 1912, the beetles were observed feeding in the blossoms of wild pumpkin in the same locality. D. K. McMillan observed the beetles at Rocky Ford from July 2 to September 14 on cucumber and melon.

---

[1] *Diabrotica nitida* Linell was observed on the same plant in August.

A PRELIMINARY SURVEY OF THE SPECIES OF MICROVELIA WESTWOOD (VELIIDAE, HETEROPTERA) OF THE WESTERN WORLD, WITH DESCRIPTION OF A NEW SPECIES FROM THE SOUTHERN UNITED STATES.

By J. R. de la Torre-Bueno, White Plains, N. Y.

In 1834, Westwood[1] established the subgenus *Microvelia* to contain a minute species of *Velia* he was describing from the Island of St. Vincent, Lesser Antilles, under the name of *pulchella*. Since that day, a large number of species have been described, by far the greater portion from the Western Hemisphere. Strange as it may seem, no attempt has been made to monograph the *Microveliae* of any region, except for the two European species, which was done by Horvath[2] in 1916. At this time, he drew attention to the notal structure in the apterous forms as affording distinct specific characters. On this side of the Atlantic the only reviews of local species have been done by Parshley,[3] by Hungerford,[4] and by myself[5]. Champion[6] has treated the *Microveliae* of Central America. Aside from this, a number have been described by Uhler,[7] in several minor works; by Kirkaldy,[8] and by Drake.[9] In these descriptions there is very little, if any, indication of relationship to other species; and, in general, specific characterization being largely by color, it is nearly impossible to control certain species. This last remark is also true of Distant's[10] Indian species.

Since many unknown species are still being taken and, as intensive collecting becomes more prevalent, many more will come to light, it seems desirable to tabulate all the species known from the Western Hemisphere. We will thus be enabled more readily to define distribution of the species of *Microvelia* and also to recognize what is known so far. It is not unreasonable to anticipate the finding of Central American species in the northern parts of North America. In fact, the first record of *M. albonotata* Champion was by the author from Guatemala; the next, by Mr. E. P. Van Duzee from New Jersey; it has since been taken not uncommonly in New York by me; and Dr. J. C. Bradley took it in Georgia. That others should also have a more extended distribution northward should therefore not be surprising.

---

[1] Ann. Soc. Ent. Fr., III, p. 647.

[2] Ann. Mus. Nat. Hung., XIV, pp. 68–71.

[3] Bull. Brooklyn Ent. Soc., XVI: 87–93.

[4] Kans. Univ. Sci. Bull., XI: pp. 122–126, 1919.

[5] Bull. Bull. Bklyn. Ent. Soc., XI: 52–61, 1916.

[6] Biol. Cent. Am., Het., II: 127–130, 1898.

[7] P. Z. S., 1893, p. 719; 1894, pp. 219–220; Pr. Cal. Ac. Sci. (2) IV: 289.

[8] Entomologist, XXXV: p. 281, 1894.

[9] Ohio Jour. Sci., XX: 207, 1920; Bull. Bklyn. Ent. Soc., XV: 19–21, 1920.

[10] Faun. Br. Ind., Rhynch., II: 171 and 174, 1904.

The key to follow includes all the Western Hemisphere species, either known to me in nature; or with enough fixed structural characters in the description to differentiate them from others with a fair degree of certainty. Those known to me are: *longipes* Uhler, *mimula* B. White, *hinei* Drake, *stellata* Kirkaldy, *borealis* Bueno, *atrata* Bueno, *vagans* B. White, *fontinalis* Bueno, *americana* Uhler, *austrina,* n. sp., *modesta* Uhler, *buenoi* Drake, *circumcincta* Champion, *setipes* Champion, *paludicola* Champion and *albonotata* Champion. Those derived from the literature are: *paoamensis* Champion, *torquata* Champion, and *flavipes* Champion; and *gerhardi* Hussey, described in the preceding pages.

Uhler in his remarks on *Microvelia marginata,* gives its distribution as "Trinidad, St. Vincent, Central America, Mexico, Cuba, and in the United States, from Florida to northern New Jersey." It might seem, therefore, that he has deemed what I have called *borealis* conspecific. However, in view of the antennal differences and of the fact that Uhler makes no mention of the curved hind tibiae in the male and of other points; as well as because of the vastly separated localities, it is evident that he had before him two species, very similar, indeed; and that he relied far too much on color and pattern as specific characters—an inference justifiably drawn from his description of *M. signata,* among others.

The species not included in this key are: *M. capitata* Guerin, *M. pulchella* Westwood, *M. robusta* Uhler, *M. marginata* Uhler, *M. signata* Uhler, *M. insignis* Distant, and *M. incerta* W. F. Kirby. There seem to be no recent redescriptions of *M. capitata, M. pulchella,* nor *M. incerta,* the last known to me only from a reference. These remain more or less doubtful at present, although they are certainly, from internal evidence, to be regarded as good species. This is likewise true of the Uhlerian species.

We may be certain of their specificity, even though at the moment they may not be controlled. The fixed and structural characters of each are as follows, abstracted from the original descriptions:

Microvelia pulchella Westwood 1834—Fusco-cinereous; rostrum 4-segmented; length, 1¼″ (2.64 mm.).

Microvelia capitata Guerin 1857—Fuscous; length 2 mm., width, 3/9 mm.

Microvelia robusta Uhler 1893—Dark brown or fuscous; antennal segment III shorter than IV; length, 2 mm.

Microvelia marginata Uhler 1893—Dull black; antennae stout; antennal segment II shortest, IV longest, III longer than I; rostrum reaching behind anterior coxae; length, 1.75 mm. to 2.25 mm.

Microvelia signata Uhler 1894—Dark brown; antennal joints long; longitudinal glabrous groove in head; rostrum reaching behind anterior coxae; length, 3 mm., width, 1 1/3 mm.

Microvelia insignis Distant 1912—Black; antennal segments III and IV subequal and longest, II shortest; head with a median subcarinate line (a most unusual feature in a *Microvelia*).

Microvelia incerta W. F. Kirby 1890 is unknown to me in nature.

The following rough key may aid in distinguishing these uncertain forms:

Key to Species not Included in Formal Key.

1. Over 2.5 mm. long (fuscous or dark brown species) 2
   Less than 2.5 mm. long (black or fuscous species) 3
2. Fusco-cinerous; antennal formula, II: I: III: IV; length 2.64 mm. .... *pulchella* Westwood.
   Dark brown; head with longitudinal glabrous groove (antennal joints long; no pronotal carina); length 3 mm. *signata* Uhler.
3. Black species 4
   Fuscous species 5
4. Dull black; antennae stout; antennal formula, II: I: III: IV; length 1.75 mm. to 2.25 mm. ....*marginata* Uhler.
   Black; antennae slender; head with central subcarinate line; antennal formula, II: I: III: IV; length 2 mm. *insignis* Distant.
5. Fuscous or dark brown species; length 2 mm.. .*robusta* Uhler.
   capitata Guerin.

The description of *Microvelia fontinalis* Bueno erroneously states that this species has ocelli, the absence of which is, of course, a family character. The fact is that the species has a deep, glabrous pit near each eye, which under the hand magnifier may be easily mistaken for a lucent ocellus. The resolving power of the binocular microscope at × 80 reveals the true nature of this structure, near which is a long, erect cilia. Others of our species have one or more of these pits, but much smaller, near the inner margin of the eyes.

PRELIMINARY KEY TO THE SPECIES OF MICROVELIA IN THE AMERICAS.

(Including the West Indies and Hawaii.)

1. Posterior femora longer than total length of insect (segment II of posterior tarsi 5 times as long as segment III; anterior femora nearly twice as long as tibiae, intermediate femora equal to tibiae, hind femora ¼ shorter than tibiae; all legs very slender; antennal formula, II : IV : I : III; length, 3 mm. to 3.25 mm.) ....*longipes* Uhler.

   Posterior femora not as long as whole insect 2

2. Antennae not longer than head and thorax taken together. .3

   Antennae longer than head and thorax taken together 9

3. Antennae equal to head and thorax taken together (or shorter in winged form of *hinei*); (sexes similar in form, hind tibiae straight in both sexes) 4

   Antennae shorter than the head and thorax taken together. .6

4. General color in greys; wings not pure white basally; antennal formula, II : I : III : IV 5

   General color black; wings pure white basally; antennal formula, II : I : III : IV; length, 2.2 mm. ....*stellata* Kirkaldy.

5. Median indented glabrous line of head absent; hind tibiae with distinct bristles; segments II and III of posterior tarsi equal in length; segment III of antennae twice as long as II; antennal formula, II : I : III : IV; length, 1.75 mm. to 2 mm. .... *mimula* B. White.

   Median indented glabrous line of head present; no bristles on hind tibiae; segments II and III of posterior tarsi unequal; segment III of antennae one and one half times as long as II; antennal formula, II : I : III : IV; length, 1.3 mm. to 1.6 mm. ....*hinei* Drake

6. Posterior tibiae curved in male, straight in female; apterous male elongate, fusiform, female orbiculate; colors in greys and blacks; antennal formula, II : I : III : IV; length, 1.6 mm. to 2 mm. .... *borealis* Bueno.

   Posterior tibiae straight in both sexes; both sexes elongate; general color black or brown 7

7. Color brown; no vestigial wings in apterous 8
Color sooty black or deep dark brown; vestigial wings in apterous; legs stoutish, short; antennal formula, II : I : III : IV; (body hairy in apterous; median groove of head distinct); length, 1.6 mm. to 2 mm. .. ..*atrata* Bueno.

8. Thorax strongly longitudinally carinate; with deep black punctures; legs long; antennae slender; antennal formula, II : I : III : IV; length, 3 mm. to 3.25 mm.. .*modesta* Uhler.
Thorax not longitudinally carinate; apterous female fusiform with much reflexed connexivum meeting at times over last abdominal segments; male subparallel, connexivum flattened; antennal formula, II : III : I : IV; length, 1.8 mm. to 2 mm. ....*vagans* B. White.

9. Antennal segment I subequal to or longer than III 10
Antennal segment I shorter than III 14

10. Antennal segment IV much shorter than II and III taken together 11
Antennal segment IV slightly longer than II and III taken together; antennal formula, III : II : I : IV; length, 1.74 mm. *buenoi* Drake.

11. Apterous form without light colored dorsal patches of pile; uniformly colored; (legs shortish, stout; antennae stout; antennal formula, I : II : III : IV; thorax longitudinally carinate; length, 1.7 mm.) ....**austrina** n. sp.
Apterous form with silvery or blue-grey patches of pile dorsally 12

12. Apterous form with dorsal patches of silvery white pile; moderately large stout forms 13
Apterous form with dorsal patches of blue-gray pile, from which in the female arise tufts of long hairs; rather small, fusiform species; winged form unknown; antennal formula, II : I : III : IV; length, 2.3 mm. ....*fontinalis* Bueno

13. Antennal formula, II : I : III : IV; head 1/3 shorter than its own width; (hemielytra unicolorous brown); length, 3 mm. *americana* Uhler.
Antennal formula, II : III : I : IV; head ¼ shorter than its own width; length, 3.3 mm. ....*gerhardi* Hussey.

14. Antennal segment III longest; antennal formula, I & II : IV : III; length, 2.75 to 3.25 mm. ....*circumcincta* Champion.
Antennal segment IV longest, or subequal to III 15

15. Antennal segments I and II, and III and IV subequal 16
Antennal segment I much longer than II 20

16. Posterior tibiae without long bristly hairs 17
Posterior tibiae with long bristly hairs on their outer edges;

male body very narrow, female obovate; antennal formula, I & II: III & IV; length, 2.5 mm. to 3 mm. *setipes* Champion.

17. Pronotum without a median ridge 18
Pronotum with a median ridge 19

18. Pronotum distinctly punctured posteriorly; color rufo-fuscous; hemielytra with prominent nervures; antennal formula, I & II: ? (the last two segments are absent in the type); length, 3.1 mm. .... *flavipes* Champion.
Pronotum not punctured; color black; hemielytra with rather feeble nervures; (antennae very slender, nearly as long as the body); antennal formula, I & II: III & IV; length, 2.25 to 2.5 mm. .... *torquata* Champion.

19. Antennal segment III slightly longer than II; antennal formula, I & II: III & IV; length, 2.75 to 3.5 mm. *paludicola* Champion.
Antennal segment III much longer than II; antennal formula, I & II: III & IV; length, 2.5 mm. .. *panamensis* Champion.

20. Antennal segment IV subequal to II and III taken together; body narrow in both sexes; legs and antennae very long and slender (hemielytra much marked with white, apterous form glabrous, slender, in both sexes); color black or greenish; antennal formula, II: I: II: IV; length, 2.25 mm. *albonotata* Champion.
Antennal segment IV shorter than II and III taken together; male slender, female obovate; apterous form pubescent, rufous; antennal formula, II: I: III: IV; length, 2.33 mm. to 2.5 mm. .... *rufescens* Champion.

Microvelia austrina n. sp.

Apterous female: *Head.*—In natural position declivous; including eyes, twice as wide as long, less than half as long as the thorax, with the usual fine glabrous median longitudinal line, scarcely visible at × 20; eyes, small globose, 1/3 as wide as the distance between them; antennae comparatively short and stout, shorter than length of head and thorax taken together, segments I, II and III equal, 3/5 as long as IV, formula, 3 : 3 : 3 : 5, basal joint curved; stoutest, III slenderest, IV fusiform, as usual; rostrum stout, segment II shortest, ringlike, III longest, tapering, IV next longest, tapering to a point, dark; I stoutest; formula, 10: 4: 16½: 13; glabrous, bucculae high, concealing segment I from side.

Thorax.—Pronotum 5/3 as long as wide, curved posteriorly; median carina pronounced but not attaining anterior or posterior margins; disk each side of carina with scattered deep punctures, absent in the transverse orange or yellow stripe on the anterior margin. Metanotum appearing as two very small lateral triangles at anterior extremities of connexivum and nearly concealed by the moderately long fine pile that covers the whole insect dorsally. Propleura tumid, a group of three or four deep punctures next the eye; and an irregular line of six or seven next the mesopleural suture. Acetabula of anterior legs prominent with a straight suture arising from and perpendicular to the edge, which is straight in profile. Mesopleura roughly triangular, apex dorsad, and disappearing under the pronotum, not reaching the upper margin of the pronotum, being shorter than the pro- and metapleura; the acetabula prominent, with a straight suture arising from and perpendicular to its edge, which is straight; two or three punctures at the margin of the acetabula. Metapleura narrowing sternally, acetabula flattened with sinuate plate-like edges; a deep foveole near the conexivum and a deep groove arising from the metapleural edge at a deep puncture, with three punctures in a row; a tuft of appressed matted hairs looking like a stout curved spine rise medially from the beginning of the acetabular swelling.

Abdomen.—Including genital segment ½ longer than wide, sides subparallel, converging posteriorly; connexivum reflexed making the dorsum trough-like with moderately sloping sides; abdominal segments 1–4 dorsally equal and ring-like, 5 and 6 a little longer, 7 longest, obliquely truncate; genital segment globosely produced; ventrally, segment 2 longer at connexivum than the others; sutures straight; two glabrous spots on each segment 2, 3, 4, 5, 6, and 7, in a line parallel to the connexivum; anterior spot close to the edge of the segment; posterior spot, in segments 5 and 6 equidistant from posterior edge of segment and anterior spot, in segments 3 and 4 nearer anterior spot than posterior edge of segment; in segment 2, anterior spot nearly concealed by the posterior edge of the metapleura, posterior midway between edges of segment; in segment 7, posterior spot closer to anterior spot than to the posterior edge of the segment; in some lights the spots seem bright and glabrous.

Legs.—Anterior pair stout, femora slightly stouter than tibiae. All tibiae and femora unarmed, pilose, and sparsely setose. All femora stouter than tibiae; all tibiae enlarged apically, all with apical combs, which in a certain aspect have the appearance of a stout spine; all claws simple, slender, moderately long. Coxae of anterior and intermediate legs, large, globose; of posterior legs, long and flattened; trochanters large and plainly visible. Formula: 1st pair, femur: tibia: tars. seg. II:: 8: 7: 3; 2d pair, femur: tibia: tars. seg. II: tars. seg. III:: 8: 3: 4; 3rd pair, 10: 11: 2: 3.

MALE: As female, except genital segment, which is globose and projects slightly beyond the 7th abdominal segment, which is dorsally transversely truncate in a straight line; connexivum reflexed vertically and bent over segments.

Dimensions: Head, long, .25 mm.; wide, .5 mm.
Thorax, long, .4 mm.; wide, .6 mm.
Abdomen, long, 1.05 mm.; wide, .6 mm.
Total length, 1.7 mm.

Color picture: Uniform brown, except transverse orange or yellow band on anterior part of pronotum and plumbeous tinge to underside of body. No other color characteristics need be given in extenso.

Type: Female, Raleigh, N. C., May 1, 1922; *allotype:* male; paratypes 3 females and 1 male, same data; collected by C. S. Brimley. Type, allotype and paratype in coll. N. C. Department of Agriculture; paratypes in coll. J. R. de la Torre-Bueno.

This little species is set off from all the others at present known from the Eastern United States by its reddish-brown color, its pilosity (except from *atrata* Bueno), and its narrow subparallel form; the unarmed stout legs also are distinctive. It may for the present be placed near *atrata.*

In passing it may be pointed out that two of the generic characters heretofore relied upon for separating this genus from *Velia* do not hold. These are, the 4th antennal segment longest and the feet of nearly equal length. As appears from the key to species, the 3rd segment may be the longest, or segments III and IV may be equal, contrary to my statement in 1923. As regards the legs, *M. longipes* Uhler, while patently a *Microvelia* on habitus and other fixed generic characters, has extraordinarily long hind legs, quite gerrine in character. It seems, therefore, as though the following reformed definition of the genus may more closely reflect known stable generic characters.

Genus *Microvelia* Westwood.

Ocelli absent; rostrum 4-segmented, passing anterior coxae; antennae 4-segmented, segment I shorter than III or IV; tarsi 2- 3- 3-jointed (counting the minute and scarcely visible basal joint), or 1- 2- 2-jointed (not counting the minute basal joint); claws subapical; hemielytra (when present) entirely membranous with few cells.

The validity of the generic characters above is discussed at length in my paper first cited.

An Alphabetical List of the American Species of the Genus Microvelia Westwood.

1.	*M. albonotata* Champion	Guatemala, C. A.; Ga.; N. J.; N. Y.; Mass.; Md.; Fla.; Ills.
2.	*M. americana* Uhler	Ontario; N. Y.; N. J.; Penna.; N. C.; Kans.; Md.; Ga.; Me.; N. H.; D. C.; Va.; Fla.
3.	*M. capitata* Guerin	Cuba; Grenada (fide Uhler).
4.	*M. atrata* Bueno	Georgia.
5.	*M. austrina* Bueno	North Carolina.
6.	*M. borealis* Bueno	New York; New Jersey; Connecticut.
7.	*M. buenoi* Drake	New York; Massachusetts.
8.	*M. circumcincta* Champion	Guatemala; Mexico.
9.	*M. flavipes* Champion	Mexico.
10.	*M. fontinalis* Bueno	New York; New Jersey.
11.	*M. gerhardi* Hussey	Colorado (other western records for *americana* may pertain here).
12.	*M. hinei* Drake	New York; Massachusetts.
13.	*M. incerta* W. F. Kirby	South America; Fernando Noronha Id.
14.	*M. insignis* Distant	Trinidad.
15.	*M. longipes* Uhler	Grenada; Ecuador, S. A.
16.	*M. marginata* Uhler	Cuba; St. Vincent; Grenada; Trinidad.
17.	*M. mimula* Buchanan White	Brazil.
18.	*M. modesta* Uhler	Grenada.
19.	*M. paludicola* Champion	Guatemala; Mexico; Texas.
20.	*M. panamensis* Champion	Panama.
21.	*M. pulchella* Westwood	West Indies.
22.	*M. robusta* Uhler	Grenada.
23.	*M. rufescens* Champion	Guatemala.
24.	*M. setipes* Champion	Mexico.
25.	*M. signata* Uhler	Lower California (Mexico).
26.	*M. stellata* Kirkaldy	Ecuador.
27.	*M. torquata* Chamipon	Guatemala.
28.	*M. vagans* Buchanan White	Hawaii (presumably introduced from America).

The distribution above is accurate, according to our best information at present. Doubtless, with the data set forth in the preceding pages, it will be possible to fix more accurately the range of many of these species, and certainly to extend it notably.

THE NEXT OF KIN.

Periodically systematists have been confronted by proposals emanating from various sources which if accepted and enforced would probably reduce the number of persons describing new forms of life and certainly curtail the flow of such descriptions. Many of these propositions are primarily intended to eliminate or curtail the activities of a specific class of workers and are not generally acceptable, but there is one proposition which has been repeatedly made and just as flagrantly ignored which ought to be accepted and enforced to the fullest extent. This is that all descriptions of new genera and species shall contain a summary of the characters that distinguish them from their nearest allies. This proposal has not been enforced by any entomological journal and in practically all orders the ssytematist finds large numbers of species names that remain to him practically *nomina nuda* because of the lack of data based upon a comparison of these species and their closest previously described allies. To make these species known requires an elaboration of the original description which can only be done after an examination of the type specimen—in other words someone else has to do all over again the work which the author who is credited with the species ought to have done in the first place.

The Brooklyn Bulletin in taking a stand that in future all new genera and species described in that bulletin must be compared with their nearest described relatives is to be highly commended and it is to be hoped widely copied by its contemporaries. But let us hope the changed attitude will not be imposed upon by such meaningless phrases as " Presumably related to *tadpolensis*," " Near *poduncensis* but larger," or the bare "Related to the *Calliope* group." Such comparisons are worse than useless and betray either indolence or ignorance.

To make an intelligent and usable comparative diagnosis takes time, requires a broad knowledge of the group one is dealing with, and the exercise of a considerable degree of deductive reasoning put forward in easily comprehensible language. Without these requirements the result is frequently a perfectly useless contribution which wastes the time and tries the patience of that worker's contemporaries.

J. R. Malloch, Washington, D. C.

PROCEEDINGS OF THE SOCIETY.

Meeting of January 10, 1924

Election of Officers for 1924

The following were elected: President, Wm. T. Davis; Vice-President, J. R. de la Torre Bueno; Treasurer, Geo. P. Engelhardt; Recording Secretary, E. L. Bell; Corresponding Secretary, Howard Notman; Librarian, Elmer McDevitt; Curator, Archibald C. Weeks; Publication Committee—J. R. de la Torre Bueno, Editor, G. P. Engelhardt, Dr. Jos Bequaert. Mr. Howard Notman was appointed Delegate to the Academy of Sciences.

Local Records.—Mr. W. T. Davis called attention to what he believed to be the occurrence of the yucca moth on Staten Island, showing seed pods of yucca from Hillside Cemetery, Graniteville, January 4, 1924.

Mr. Davis also exhibited four of the five known specimens of the Cicada *Okanagana viridis,* originally described from Mississippi. He stated that three had been found in that state, one in Arkansas and one in Tennessee. *Melampsaltra kansa* which is also green; and the green phase *floridensis* of *M. calliope* Walk. were likewise shown. There are in North America but few species of Cicadas green or nearly all green in color.

Mr. Engelhardt, referring to his remarks at a preceding meeting, on the clear wing moths, showed specimens of *Metillia gloriosa,* bred, received from Mr. B. G. Thomson, of Corvallis, Oregon. He also presented remarks on injury to pine forests in Oregon, by the moth *Coloradia pandora* (see Bulletin XIX: 35–37).

C. Schaeffer, *Sec. pro tem.*

Meeting of February 14

Dr. M. D. Leonard was proposed for membership by Mr. Bueno.

Local Records.—Mr. A. C. Weeks reported flies and honeybees attracted to fruit at Yaphank, L. I., on February 3. Mr. Schott exhibited a male *Alaus myops* Fab. and a female of *A. oculatus* Linné *in cop.,* taken by him at Wyandanch, Long Island, on June 4, 1922, under the bark of a pitch pine.

Mr. Schaeffer gave an account of a similar case of two species being found in copulation, the species being *Diachus auratus* Fabr. and *Diachus pallicornis* from the Catskill Mountains.

Mr. Davis called attention to his paper in BULLETIN OF THE BROOKLYN ENTOMOLOGICAL SOCIETY, Vol. XV, No. 5, December, 1920, Page 145, in which he gives an account of finding *Melasoma interrupta* Fabr. and *Melasoma tremulae* Fabr. in copulation, which is as follows: "The writer discovered a male *interrupta* that was apparently in copulation with a female *tremulae,* but as the insects had been disturbed we were not sure. They were, however, removed with a few of the willow leaves to a bottle, and on the evening of June 18th were found in copulation and examined with a glass to avoid any chance of error."

He also called attention to his "Miscellaneous Notes on Collecting in Georgia," Journal N. Y. Ento. Soc., Vol. XIX, Page 216, December, 1911, as follows:

"The most interesting *Cicindela* observation was made on July 25th, in the trail leading along Tuckololuge Creek, where I saw a male *Cicindela sexguttata* apparently in copulation with a female *Cicindela punctulata.* The pair were promptly collected to avoid chances of error in regard to sex."

Scientific Programme.—Mr. Torre-Bueno read a paper "On a Few Rare Heteroptera from New England," published in this BULLETIN, XIX: 48–51.

Mr. Notman gave a very interesting account of the Lepidoptera collected by him in the Glacier National Park during the latter part of June and the first part of July, 1923, illustrating his remarks with photographs which he had taken and showing three boxes of specimens, which included specimens of *Brenthis astarte* Doubleday and Hewitson and *Brenthis alberta* Edwards, this being apparently the first record of the occurrence of these species in the United States. He also spoke of his surprise and pleasure in meeting Mr. Engelhardt while there and of the difficulty in collecting on some of the steep slopes and the care that must be exercised not to go too near to the edge of the precipices in one's eagerness to catch specimens as the loose stones and the crumbling edges might cause one to go over.

Mr. Engelhardt spoke of the well defined faunal limits of some butterflies between the Rocky Mountains proper and the Pacific Coast Ranges, commonly referred to as the Sierras. *Parnassius smintheus* from Glacier National Park, Mont., were shown as typical Rocky Mountain species and *Parnassius clodius* from Cascade Mountains, Washington, and Crater Lake, Oregon, as the Sierra species. Examples of *Anthocharis* and *Melitaea* further illustrated his remarks.

Meeting of March 13.—Mr. Perry A. Glick and Mr. Wm. L. Lawler, Jr., proposed by Mr. Bell; and Dr. M. D. Leonard, proposed at the last meeting of the Society, were elected to membership.

Mr. Davis read a letter from Mr. J. H. Emerton telling of the activities of the Cambridge Entomological Club's members and showed a paper by him, published in Psyche, Vol. XXXI, No. 1, 1924, entitled "Early History of the Cambridge Entomological Club.

Mr. Torre-Bueno offered the following resolution: "RESOLVED: That the Brooklyn Entomological Society extends its heartiest greetings to the Sociedad Entomológica de España, through Dr. M. D. Leonard, its member about to visit Spain," which was duly passed.

Local Records.—Mr. Wm. T. Davis showed the dragon-flies *Somatochlora tenebrosa* Say, and *Somatochlora linearis* Hagen, and remarked upon their beautiful coloring in life. On Long Island he had collected the first named species at Hauppaug, August 9th, 1912, and at Wyandanch, August 21st, 1917. On Staten Island only *linearis* had been found, and it, at but one locality. In July and August, 1922, several *linearis* were flying along the deeply tree-shaded Betty Holme's Brook that flows through the woods from near Eltingville north to the salt meadows and the Kills. *Somatochlora filosa* and *S. provocans* are the other species of the genus most likely to occur on Long Island.

Mr. George P. Engelhardt addressed the Society on his experiences and observations while on an expedition for the Brooklyn Museum to collect specimens of mountain lions and mule deer on the plateaus of southwestern Utah during the past summer.

While it proved comparatively easy to obtain what was needed of the deer, the hunting of the lions involved extensive travelling over the roughest kind of country, including the rim of Zion Canyon, the Kolob Canyon, Bryce Canyon and other regions which of late years have become noted as among the scenic wonders on the continent. Mr. Engelhardt referred to the collections obtained here by naturalists on the early expeditions of the U. S. Biological Survey, including species of Lepidoptera which have not been turned up again since that time. This in part may be due to excessive sheep grazing which over large sections has resulted in the destruction of the native flora. Many colored lantern slides of the regions visited were shown.

Mr. Davis showed a copy of the List of Coleoptera of Staten Island, N. Y., by Mr. C. W. Leng and himself, published in the Proceedings of the Staten Island Institute of Arts and Sciences.

MEETING OF APRIL 10, 1924

Long Island Records.—Mr. Engelhardt reported finding *Eutolype rolandi* Grote on April 6th at Creedmore, he secured a number of specimens that were resting on the electric light poles along the highway, they were usually well up on the poles and a long stick was necessary to dislodge them.

Mr. Bell reported seeing a single specimen of *Pieris rapae* Linnaeus at Flushing, on April 5th. Mr. Schaeffer stated that his record, in the Minutes of February 14th, of *Diachus auratus* and *Diachus catarius* being found in copulation should be changed to read *Diachus auratus* and *Diachus pallicornis*; this correction has been made by the Secretary.

Mr. Torre-Bueno exhibited some new species of *Rhagoveliae* from the United States.

Mr. W. T. Davis presented a paper on "The Seventeen Year Cicada on Long Island with Particular Reference to its Appearance in 1923," exhibiting specimens and maps showing the known distribution of each of the six broods so far recorded on the Island. The paper appears in this BULLETIN.

MEETING OF MAY 15, 1924

Local Records.—Mr. Davis reported having seen two specimens of *Danaus archippus* Fabricius on May 5th at Ward's Point, Staten Island, and one at St. George, Staten Island, on May 6. He gave an interesting account of the behavior of one of the specimens, the details of which he expects to publish in full.

Mr. Schaeffer read his paper *"On Some Chrysomelidae of New York State,"* illustrating his remarks with specimens. He particularly spoke of his long study of this group and his work in examining the specimens in various collections in this country and obtaining other specimens from abroad; of the great variations in individuals of the same species, many of which have been described as distinct species; of where the different species are found and their habits.—E. L. BELL, *Secretary.*

Notice to Subscribers only.—Please use the enclosed slip for your renewal for 1925. Society members will be billed for their subscriptions with their annual dues.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

PAPUAN INSECTS.—Will collect Coleoptera, Lepidoptera and other orders. Correspondence promptly answered. T. K. Scheibel, c/o G. A. Loudon & Co., Port Moresby, Papua.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 81 Robert St., Toronto, Ont., Canada.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

WANTED.—Odd numbers of the first volume of this Bulletin. J. R. de la Torre-Bueno, 11 North Broadway, White Plains, N. Y.

WANTED.—Vols. I, II and III, this Bulletin. N. Y. Public Library, 5th Ave. and 42d St., New York, N. Y.

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages — 1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

One of the most beautiful red gold butterflies of the world—

Chry. virgaureae—for only 6 cents each, as long as the stock lasts. Other small species for decorative purposes at 2 cents to 5 cents each; and also exotic Lepidoptera.

Our New List of Books, Pins, Apparatus and Supplies free.

Our Price List No. 58 contains 28,000 species of Lepidoptera, the greatest and most extensive of all lists	$1.00
Price List No. 30 contains 30,000 species of Coleoptera	.50
Price List No. VII, 10,000 species of other insects	.50

Price of the catalogue will be allowed for in billing orders for Insects.

Kindly send price in dollar bills; or in postage stamps.

DR. O. STAUDINGER & A. BANG-HAAS
BLASEWITZ, DRESDEN, GERMANY

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Vol. XX 1925

SMITHSONIAN INSTITUTION
MAY 7 1926
NATIONAL MUSEUM

EDITED (IN SUCCESSION) BY

F. G. SCHAUPP JOHN B. SMITH GEO. H. HULST
CHAS. LOUIS POLLARD R. P. DOW J. R. de la TORRE-BUENO

PUBLICATION COMMITTEE

J. R. de la TORRE-BUENO, *Editor*
G. P. ENGELHARDT J. BEQUAERT

THE SCIENCE PRESS
PRINTING COMPANY
LANCASTER, PA.

INDEX TO VOLUME XX.

(Arranged alphabetically throughout.)

Subjects and Authors.

GENERAL SUBJECT.

Book Notes: Encyclopédie Entomologique. Série B. Mémoires et Notes. II—Diptera. J. Bequaert, 151
  Fauna of N. E., 15. List of the Diptera or Two-Winged Flies. J. Bequaert, 150.
  Galápagos: World's End. J. R. T. B., 99
Editorial: On a Universal Language. J. R. T. B., 98
Herman A. Brehm, Charles Rummel, 96
The New York State List of Insects, 58
Third International Congress of Entomology, Henry M. Skinner, 16

COLEOPTERA.

A New Species of *Strigodermella,* W. J. Brown, 200
An Outline of the Ecology of the Gyrinidae, Melville H. Hatch, 101
Apteromechus microstictus, H. C. Fall, 123
New Species of *Apion* and *Apteromechus,* H. C. Fall, 85
New Species of Coleoptera of Recent Discovery, H. C. Fall, 180
Note on *Lixus fimbriolatus,* H. F. Chittenden, 103
Note on the Sweet Potato Leaf Beetle and a Related Mexican Form, F. H. Chittenden, 91
Occurrence of *Meligethes aeneus* Fab. in the U. S., F. H. Chittenden, 149

DIPTERA.

A New Borborid from Maryland, J. R. Malloch, 97
A New North American Species of Hydrotea, J. R. Malloch, 184
Beris quadridentata Walker, O. A. Johannsen, 214
North American Species of *Borborus* Meigen and *Scatophora* Robineau-Desvoidy, Anthony Spuler, 1

HETEROPTERA.

A Giant Water Strider from Tonkin, W. E. China, 218
A New Food Plant of *Ischnorhynchus geminatus,* J. R. de la Torre-Bueno, 60

A New Hydrometrid Genus from Honduras, Roland F. Hussey, 115
A New *Rhinacloa* and Three New Species of *Lepidopsallus,* Harry H. Knight, 225
A Note on Tropisms of *Plea striola* Fieber, Leonard B. Clark, 186
A Study of the *Interrupta-Harrisii* Group of the Genus *Arctocorixa,* with Descriptions of New Species, H. B. Hungerford, 141
Collecting *Microveliae* in Hawaii, E. H. Hoffman, 132
Descriptions of Thirty New Species and Two New Genera of North American Miridae, H. H. Knight, 33
Errata in Microveliae of the Western World (J. R. T. B.), 187
Food Plant of *Corythucha marmorata* Uhler, J. R. de la Torre-Bueno, 178
Hydrometra australis in New York State, R. F. Hussey, 16
Notes on a Few Hemiptera from the San Bernardino Mountains, California, E. P. Van Duzee, 89
Note on *Gerris mikado* Kirkaldy, J. R. de la Torre-Bueno, 220
Note on *Podops cinctipes* and *Solubea pugnax,* Wm. T. Davis, 147
Notes on the Behavior of *Leptoglossus oppositus* Say, F. H. Chittenden, 148
Notes on Some North American Corixids from the South West, H. B. Hungerford, 17
On the "Annectant Bugs" of Messrs. McAtee and Malloch, E. Bergroth, 159
Some Aquatic Hemiptera Having Only Four Nymphal Stages, William E. Hoffmann, 93
Some Winter Bugs, J. R. de la Torre-Bueno, 70
Two New Species of *Carthasis,* Halbert M. Harris, 172
Velia watsoni Drake—A New Record, J. R. de la Torre-Bueno, 185

HOMOPTERA.

Membracidae of Cuba, Z. P. Metcalf and C. S. Bruner, 203

HYMENOPTERA.

Another Gall that Secretes Honeydew, Lewis H. Weld, 175
Eumenes dyscherus H. de Saussure, a Neotropical, not an African Wasp; and other Notes on Synonymy, J. Bequaert, 134

LEPIDOPTERA.

California Butterfly Notes—III—Karl R. Coolidge, 146
Changes in the Synonymy of Lepidoptera Arising from the Examination of Some Types in the Brooklyn Museum, Wm. Barnes and F. H. Benjamin, 189

Hints on Mounting Lepidoptera, William C. Wood, 229
Hylephila phylaeus Drury, E. L. Bell, 231
New North American Butterflies, George A. Ehrmann, 84
Note on *Pieris rapae* and *Brephos infans,* W. Prescott Rogers, 228
Notes on Early Spring Collecting of Noctuidae, George P. Engelhardt, 61
On the Distribution of *Feralia deceptiva* McD., Wm. Barnes and F. H. Benjamin, 90
On the Synonymy of *Cerapoda oblita* with Notes on the Type of *"Agrotis" insertans,* Wm. Barnes and F. H. Benjamin, 95
Some Rhopalocera of Eastern United States, including Three New Forms, Waro Nakahara, 221
Studies on North American Aegeriidae, George P. Engelhardt, 61, 153, 215

THYSANOPTERA.

Four New Phloeothripidae from New York, J. Douglas Hood, 26
New Species of *Frankliniella,* J. Douglas Hood, 71
Notes on New York Thysanoptera, with Descriptions of New Genera and Species, J. Douglas Hood, 124

MINOR ORDERS.

The Neuroptera and Mecoptera of Kansas, Roger C. Smith, 165
The Grasshopper *Melanoplus differentialis* on Staten Island, Wm. T. Davis, 199

INDEX TO GENERA AND SPECIES OF INSECTS AND PLANTS.

New forms in **bold face**; valid genera and species in Roman; synonyms in *italics*; * indicates plants.

(For Heteroptera in winter, see p. 70; for Neuroptera and Mecoptera found in Kansas, see pp. 165 et seqq. Genera and species mentioned therein not indexed.)

* Acacia greggi, 54
* Acer saccharum, 129
Acutalis, 204
* Adenostoma, 90
Afotella cylindrica, 195
Agrilus frosti, 182
  juglandis, 182
  otiosus, 181, 182
  transimpressus, 181
Agrotis, see Cerapoda, 95, 96
  conflua, 189, 190
  jucunda, 190
  perconflua, 189, 190
  tenuicula, 189, 190
  tenuicola, 189, 190
  treatii, 190, 191
* Ailanthus glandulosa, 120
Alcathoe **carolinensis,** 155
  caudata, var. walkeri, 153, 154, 156, 158
  korites, 153, 154
  pepsioides, 155, 157, 158
    subsp. **atra,** 155, 156, 158
Alcecoris, 163
Aleptina, 194
Allactina, 214
Amblycentrus, 211
Anasa tristis, 148
Ancistrocerus, 140
Androgyrus, 104
Apion **atripes,** 86
  bischoffi, 86
  diffractum, 87
  dilaticolle, 85, 86
  finitimum, 87
  pennsylvanicum, 86
Apteromechus, 87
  ferratus, 88, 123
  microstictus, 88, 123
  texanus, 88
Aquarius elongatus, 230
Arctocorixa abdominalis, 18 et seqq.
  californica, 18, 19
  compacta, 22
  femorata, 21, 23
  gerhardi, 21
  harrisii, 141 et seqq.
  interrupta, 141 et seqq.
  laevigata, 17
  lobata, 143, 144
  melanogaster, 20 et seqq.
  obliqua, 142, 144
  serrulata, 17
  uhleri, 19
  unguiculata, 20 et seqq.
  utahensis, 22
  vulgaris, 143, 144
* Arisaema dracontium, 126
  * triphyllum, 126
Atractotomus **acaciae,** 34
  albidicoxis, 34
  hesperius, 34
Atymna, 201
Aulonogyrus, 104
  striatus, 110
Autographa, see Cerapoda

* Bacida buceras, 213
Basilarchia arthemis var. albofasciata, 223
  arthemis, 224
    form atlantis, 224
  astyanax, 223, 224

- * Belaria mucronata, 211
- Beris quadridentata, 214
  - viridis, 214
- * Betula lenta, 60
- Bidessus flavicollis, 106
- Borborus annulus, 5, 6
  - arcticus, 9, 12
  - armati, 3
  - *brevisetus,* 11
  - **calcitrans,** 13, 14
  - equinus, 1, 2, 12, 13
  - **frigipennis,** 8, 9
  - *geniculatus,* 1, 2
  - **immensus,** 4
  - inermes, 3, 8
  - lacteipennis, 8, 9
  - **maculipennis,** 6
  - marmoratus, 8, 11
  - *minutus,* 11
  - neglectus, 13, 14
  - niger, 4, 5
  - nigrofemoratus, 13, 15
  - **peltastes,** 8, 11
  - scriptus, 8, 11
  - **setitibialis,** 5, 6
  - **singularis,** 9, 12
- **Brachycentrus,** 211
  - **hirsutus,** 213
  - **punctatus,** 212
- **Brachytalis fuscoalis,** 205
  - **fuscus,** 204, 205
- Brephos infans, 228
- Bromeloecia, 97
- Buenoa, 132

- Calocampa, 60
- Calocoris, see Horcias
- Calophasia, see Cerapoda
- * Carissa acuminata, 75
- Carneades, see Cerapoda
- Carthasis *contrarius,* 174
  - decoratus, 174
  - **distinctus,** 173, 174
  - **gracilis,** 172
  - minor, 174
  - rufonotatus, 174
- * Castanea dentata, 61 et seqq.
- Catonia cara, 90
- Centrotus flavidus, 203
  - havanensis, 203, 207
  - poeyi, 203, 207
- Cerapoda deserta, 95
  - insertans, 95
  - oblita, 95
  - strigata, 95
- Ceratocapsus **apicalis,** 46
  - apicatus, 46
  - **clavicornis,** 47
  - **denticulatus,** 46
  - drakei, 46
  - fusiformis, 46
  - pumillus, 47
- Ceresa uniformis, 203
- * Chara, 186
- * Clematis, 154
  - * ligustrifolia, 157
  - * virginiana, 156
  - * vitalba, 156
- Colias philodice
    - ab. inversata, 223
    - f. **plicaduta,** 222
    - ab. **rothkei,** 223
  - hyale polygraphus kutsukakensis, 223
- Compastes, 161
- Copipanolis cubilis, 60
- Copromyza, 13
- Coquillettia **albiclava,** 36
  - insignis, 35, 36
  - **nicholi,** 35
- Corixa harrisii, 141
  - interrupta, 141
- Cordylanthus, 89
- * Cornus sericea, 62
- Corythucha ciliata, 179
  - marmorata, 179
- Coxina, 197
- Crumomyia, 4
- Cutina albopunctella, 198
  - *distincta,* 198
  - *inquieticolor,* 198
- Curicta sp., 94

Cyclinus, see Dineutus, 110
Cyclous, see Dineutus, 110
Cylindrostethus, 18
Cyrtolobus, 211
Cyrtorhinus caricis, 42
    insperatus, 42

Darnoides *semicrema*, 203, 209
* Dasiptemon pedicularia, 60
Deraeocoris, 50
Diaphania nitidalis, 148
Diarsia, see Agrotis, 189
Diarthrotarsus, 161
Dineutus, 102 et seqq.
    americanus, 104, 109, 110
    angustus, 106
    discolor, 105, 107, 109
    emarginatus, 104
    longimanus portoricensis, 106
    metallicus, 104
    nigrior, 104 et seqq.
    hornii, 105, 106, 108, 109
    productus, 105
    robertsi, 106
    serrulatus, 106
    truncatus, 104, 106
    unidentatus, 104, 106, 110
    vittatus, 106
Diphleps, 159 et seqq.
Disholcaspis eldoradensis, 175
* Doellongeria umbellata, 62, 63

Echinocloa colona, 79
* Elodea, 186
Enchotypa concinna, 203, 206, 207
    fairmairii, 206, 207
Enchotype, 206
Enhydrus, 104
Epipsilia elevata, 191
    terrifica, 191
Episilia, 191
Erastria, 198
* Eriodyction californicum, 89, 90
Escaria, 194
Eumenes caffer, 138
    campaniformis, 134, 138
        var. **pseudodyscherus**, 138
    canaliculatus, 137
    centralis, 134, 135
    chalicodomae, 134, 135, 137
    coarctata, 137
    dyscherus, 134 et seqq.
    lepeletieri var. hottentotus, 138
    magna, 134, 135
    maxillosus, 134, 136, 137, 138
    wagnerianus, 137
Eurema **biedermanni**, 84
Eurymus eurytheme, 146
Eustictus catulus, 37, 38, 39
    claripennis, 40
        var. **clarus**, 40
    hirsutipes, 39
    minimus, 37
    morrisoni, 38
    obscurus, 37
    productus, 38
    pusillus, 41
Eustrotia, 198
Eutettix pubaenea, 89
Euthrips, 73
Eutolype rolandi, 59
Euxoa, see Cerapoda, 95
Everes comyntas, ab. watermani, 224

Feralia *columbiana*, 90
    deceptiva, 90
    major, 60
Fotella cervoides, 194
    cylindrica, 194
    fragosa, 194, 195
    notalis, 194
    olivia, 194, 195
    olivioides, 195

Fornax molestus, 181
  orchesides, 181
  rugicollis, 181
Frankliniella, 71 et seqq.
  achaeta, 80
  ameliae, 77
  bagnalliana, 79
  cephalica, 72 et seqq.
  cubensis, 72, 74
  difficilis, 72, 73, 74
  distinguenda, 72, 74, 78
  exigua, 78, 79
  gemina, 72, 74
  genuina, 79
  gossypii, 78, 79
  helianthi, 78, 79
  intonsa, 76
  melanommata, 72, 74, 75
  minima, 80, 81
    var. paraguayensis, 80
  occidentalis, 72, 76
  oxyura, 80, 71
  panamensis, 76
  parvula, 75
  tenuicornis, 73
  tritici, 72, 73, 74
    var. *bispinosus, 72*
  tympanona, 81
  williamsi, 72, 77
  zeteki, 75

Gerris chilensis, 220
  elongatus, 220
  mikado, 219, 220
Goniolomus tricorniger, 203, 207
Graphiphora, 60
Gyrinus, 104 et seqq.
  consobrinus, 105
  marinus, 105, 110
  natator, 106
  parcus, 104
  plicifer, 105

Hadena, 195
Hadenella, 194
Halobates, 99
Haplothrips, 29
Heidemannia, 163 et seqq.
*Helianthus stramosus, 113
Hemiberis, 214
Heterogaster behrensii, 89
Heterothrips arisaemae, 126, 130
  limbatus, 124, 130
  vitis, 126
Hindsiana **dodgei,** 26
  pullata, 27
Homohadena, 192, 195, 196
Hoplandothrips, 127
Hoplophora fairmairii, 203
Horcias fasciativentris, 50
  var. **imitator,** 51
Hyalochloria bella, 89
Hydrometra, 116, 118
  australis, 16
Hydrotaea comata, 185
  nidicola, 184
  occulta, 185
Hygrotrechus, see Gerris
Hylephila phylaeus, 231

Ibidion exclamationis, 183
  polingi, 182
  townsendi, 183
Idioderma varia, 206
  virescens, 206
Idiotropus, 159 et seqq.
Ischiodontus **granosus,** 180
Ischnorhynchus geminatus, 60
Isometopidea, 163

Jodia rufiago, 60
* Juglans niger, 182
* Juniper monosperma, 44
  * pachyphloea, 44

* Lavatera assurgentiflora, 146
Leionotus, 139

Lepidopsallus, 225, 226
  miniatus, 226, 227
  olseni, 226, 227
  ovatus, 227
  pusillus, 227
  rubidus, 226, 227
Leptocera bromeliarum, 97
  winnemana, 97
Leptoglossus oppositus, 148
Leptolestes, 161
Lidopus, 163
Limenitis *ursula* var. albofasciata, 223
Limnobatodes, 115
  paradoxus, 117
Limnometra **gigas,** 218
Limnotrechus, see Gerris
  elongatus, 219
Lixus fimbriolatus, 123
Lopidea, 41
Lopidella, 41
  flavoscuta, 41
Loxophora transversa, 90
Loxostega plana, 198, 199
  roseiterminalis, 199
Lygus (Neolygus) **deraeocoroides,** 50
  nubilus, 89
  parshleyi, 50
* Lupinus arborens, 146

Macrogyrus, 104
Macrotyloides apicalis, 89
Macrotylus amoenus, 35
  geminus, 35
* Malva sp., 146
  * borealis, 146
  * parviflora, 146
* Malvastrum fasciculatus, 146
Mallochiola, 160 et seqq.
Mamestra, 193
Melanoplus differentialis, 199
Meligetes aeneus, 149
Membracis fasciata, 203
Merolonche dolli, 60
Microvelia albonotata, 93, 94, 187
  americana, 93
  borealis, 93, 94, 132
  buenoi, 93, 94
  hinei, 93, 94
  pacifica, 132
  panamensis, 187
Microphysa tenella, 160
Micrutalis, 203
  calva, 204
* Misanteca trianda, 211
Monobelus fasciatus, 203, 209
  flavidus, 203, 209
  irroratus, 211
  lateralis, 203, 209
  niger, 210
  turquinensis, 210
Montezumia andeus, 138
Myiomma, 163, 164
  cixiiforme, 164
  fieberi, 164
* Myriophyllum, 186
Myrmedobia, 160 et seqq.
  tenella, 160

Nabidomorpha, 160
Namangana epipaschia, 195
  praeacuta, 196
Nealeria, 161
Neoborella, 48
  tumida, 48
Neoborus, 48
Neocoelidia candida, 89
  lineata, 89
Neocorixa, 19
  snowi, 20
Neolygus, s. g. Lygus, q. v.
Nepa apiculata, 94
  cinerea, 94
Nessorhinus **gracilis,** 208
  vulpes, 208
Noctua, see Agrotis
Nortonia, 139, 140
Notonecta undulata, 186, 187

Odynerus, 140
  intermedius, 140
  (Hypodynerus) *tapiensis,* 138
Olina, 1 et seqq.
Oncocnemis (see also Cerapoda, 95)
  chorda, 193
  extremis, 193
  refecta, 193
Orechtochilus villosus, 106, 109, 111
Orectoderus obliquus, 36
Orthobelus havanensis, *207*
  poeyi, *207*
Orthotylus spinosus, 43

Pachnobia, 60, 191
Pachymenes, 140
  andeus, 138
  sericeus, 140
  tapiensis, 138
Pamillia **affinis,** 45
  behrensii, 45
  nyctalis, 44
  pilosella, 45
Papilio americus, 84
  asterias, ab. **ehrmanni,** 84
  glaucus canadensis, *221*
  melasina, 84
  turnus, *222*
Paragrotis, see Cerapoda, 95
Peritropis, 159 et seqq.
Phalaecus, 161
Phaeocyma, 197
Pheocyma, 197
Philosamia cynthia advena, 120
Phlepsius occidentalis, 89
Phloeobiothrips, 127
  tumiceps, 127, 130
Phloeothrips (Hoplandothrips) insolens, 127, 128, 129
Phorocera saundersii, 147
Phytocoris **acaciae,** 52
  angusticollis, 57
  consors, 55
  corticevivens, 52, 53
  covilleae, 54
  cuneotinctus, 55
  discretus, 89
  diversus, 56
  formosus, 89
  interspersus, 52
  junceus, 57
  mellarius, 56
  nigripubescens, 55
  roseotinctus, 52
  rufus, 52
  strigosus, 51
  vividus, 55
Phytometra, 199
Pieris *immaculata,* f. aestivus, *222*
  metra, *222*
  rapae, 146, *222, 228*
Plagiognathus blatchleyi, 33, 34
  flavescens, 33, 34
  rosicola, 34
Platyperigea, 196
Platytatus, 161
Plea minutissima, 186
  striola, 186
Podops cinctipes, 147
Polia brachiolum, 192
  gnata, 192
  rubrifusa, 192
  selama, 192
  umbrosa, 192
Porrhorhynchus, 104, 106
* Potamogeton, 106
Prorachia, 194
Prothymia, 198, 199
* Prunus sp., 126
Psallus **suaedae,** 34
Psaphidia resumens, 59
Psyllia alni americana, 89

* Quercus lobata, 50
  * reticulata, 175

Ranatra americana, 94

* Ranunculus, 149
Reduvius, 161
Rhododendron, 126
Rhinacloa forticornis, 225
    subpallicornis, 225
Rhizagrotis, see Cerapoda, 95
Rhynchothrips, 29
    russelli, 31

Sanina korites, 153, 154
    uroceriformis, 154
    verrugo, 153, 154
Scaphoideus blandus, 89
Scatophora, 1 et seqq.
    carolinensis, 1
Scopelosoma, 60
Scotomedes, 159
Setagrotis, 191
* Sidalcea malvaeflora, 146
* Solidago, 179
Solubea pugnax, 147
* Sphaeralcae ambigua, 146
Sphex maxillosus, 137
* Spirogyra, 132
* Spiraea salicifolia, 60
Stictocephala rotundata, 203, 206
Stirotarsus, 161
Stratioborborus, 4
Strigodermella floridana, 201
    knausi, 200
    pygmaea, 200, 201
* Suaedae subfrutescens, 35
Synanthedon acerni, 64
    acerrubri, 63, 64
    albociliata, 67, 215
    andrenaeformis, 67
    auritincta, 68, 216
    bassiformis, 64
    castaneae, 61
    corni, 62, 64, 65
    pictipes, 61, 66
    viburni, 65, 67

Taeniothrips, 81
Taseopteryx, 198
Teratodia, 163
Thamnotettix pasadena, 89
Thrips (Euthrips) *maidis,* 73
    nervosus, 73
Ticida cingulata, 90
    transversa, 90
Timodema miracula, 90
Tolania **punctata,** 213
Trachytalis, 204
Trichiaspis, 1
Trichocorixa, 20
Trichothrips americanus, 30
    angusticeps, 30
    fumiceps, 29
    marginalis, 30
    pedicularis, 30
    semicaecus, 30
* Typha, 147
Typophorus viridicyaneus, 91, 92
    var. sturmi, 91, 92

Uhleriella coquilleti, 89
* Urtica holosericea, 147
    * urens, 147

Vanessa cardui, 146
    carye, 146
Velia, 93, 118
    stagnalis, 185
    watsoni, 185
Vespa coarctata, 137
Viburnum dentatum, 66

Wetmorea, 163

Xylina, 60

Zale termina, 197
    yavapai, 197
Zeuzera pyrina, 65

New Genera in this volume, 9.
New Species, Subspecies and Varieties in this volume, 104.

XX FEBRUARY, 1925 No. 1

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

Smithsonian Institution
FEB 26 1925
National Museum

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed February 25, 1925

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1924

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
HOWARD NOTMAN

CONTENTS

N. A. SPECIES OF BORBORUS MEIG. AND SCATOPHORA R.-D., Spuler 1
THIRD INTERNATIONAL CONGRESS OF ENTOMOLOGY, Skinner 16
HYDROMETRA AUSTRALIS IN NEW YORK, Hussey 16
N. A. CORIXIDS FROM THE SOUTHWEST, Hungerford 17
FOUR NEW PHLOEOTHRIPIDAE FROM NEW YORK, Hood 26
NEW SPECIES AND GENERA OF N. A. MIRIDAE, Knight 33
N. Y. STATE LIST OF INSECTS 58
EARLY SPRING COLLECTING OF NOCUIDAE, Engelhardt 59
FOODPLANT OF ISCHNORHYNCHUS GEMINATUS, Bueno 60

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XX February, 1925 No. 1

NORTH AMERICAN SPECIES OF BORBORUS MEIGEN, AND SCATOPHORA ROBINEAU-DESVOIDY.[1]

By Anthony Spuler, Pullman, Washington.

Introduction.

Dr. Oswald Duda in his revision of the old world forms of the genus *Borborus* reduces the genus *Olina* to a subgenus of *Borborus*. *Olina* lacks the tibial spur found in *Borborus*. Duda regards this character as unimportant but the writer feels that the absence or presence of such a character as a tibial spur is of generic importance and that the genus should be retained.

The species *B. geniculatus* Macq. is the same as *S. carolinensis* Rob.-Des. and should be regarded as a synonym of *carolinensis*. The genus *Scatophora* was established in 1830 with *carolinensis* as the genotype. (Myod. 811. 1830.) *B. geniculata* the type for the genus *Olina* was not described until 1835. (Macquart: Suites à Buff. II. 567. 6, 1835.) Fom the standpoint of priority *Scatophora* should replace *Olina*.

In his subdivision of the genus *Borborus*, Dr. O. Duda erects the subgenus *Trichiaspis* but does not designate a type species. However, he names *B. equinus*, the genotype of *Borborus* as one of the species that comes within this subgenus. Since *B. equinus* is the genotype of *Borborus* the subgenus containing *B. equinus* should be called *Borborus*. This paper is one of a series of papers on the family Borboridae. Unless otherwise designated, the type species were placed in the Melander collection.

---

[1] Contribution from the Division of Entomology of the Agricultural Experiment Station, State College of Washington.

Scatophora and *Borborus* comprise a group in the Borboridae whose species have a distinct second basal and anal cells and a complete fourth vein. These species also have some bristles or setae on the mesonotum and scutellum. The genera *Scatophora* and *Borborus* can be separated as follows:

Hind tibiae without an apical spur; scutellum with three pairs of convergent setae and two apical bristles. **Scatophora** Rob.-Des.

Hind tibiae with an apical spur; scutellum with four or more marginal bristles .... **Borborus** Meig.

Scatophora carolinensis Robineau-Desvoidy. (Fig. 12.)

Robineau-Desvoidy: Myod. 811. XI. (1830).

geniculata Macquart: Suites à Buff. II. 567. 6 (1835). (*Borborus*); Duda: Arch. f. Naturg. 89. abt. A. 4. 99 (1923). (*Olina.*)

Shining black species. Front much broader than deep with an M-shaped reddish yellow area on lower margin, interfrontal bristles in eight pairs; orbital stripes with numerous setulae; bristles of vertex and occiput not very strong; face deeply concave in profile, labrum produced; third antennal joint ovate, piceous; arista almost bare, three times antennal length; cheeks yellowish anteriorly, two-fifths as high as eye. Mesonotum with a single pair of dorso-central bristles; acrostichal setulae short, in four rows; scutellum broad and short, posterior margin rounded, with three pairs of convergent setae and two apical bristles. Wings hyaline; second section of costa three times as long as third; inner crossvein beyond basal third of discal cell, fifth vein produced slightly beyond outer crossvein. Legs black with coxae, trochanters and knees yellowish; front femora incrassate; hind femora long and curved, hind tibiae devoid of an apical spur; hind metatarsi thickened, three-fourths as long as the second joint. Length 4 mm.

One hundred and ninety-four specimens from the following localities were examined: WASHINGTON: Ilwaco (Spuler), Pullman (Mann-Melander), Lynden, Mt. Constitution, Chimacum, Spokane, Friday Harbor, Stevenson, Wawawai, Winlock, Clarkston, Seattle, Woodland, Pt. Gamble, Washougal, Tokeland, La-Center, Kamiac Butte, Almota, Bellingham, Nahcotta, and Kennewick (Melander). IDAHO: Moscow (Melander). BRITISH

COLUMBIA: Nelson (Melander). CALIFORNIA: Muir Woods (Melander), Redwood Canyon, Leona Heights, Mesa Grande, Berkeley Hills (Cresson). MONTANA: Libby (Melander), Hamilton (Asbury and Stiles). OHIO: Wauseon (Hine). ILLINOIS: Champaign Co. (Snow). INDIANA: Lafayette (Melander). VERMONT: Lynden (Melander). MASSACHUSETTS: New Bedford (Hough), Greenfield, Forest Hills (Melander). NEW YORK: Geneva, Cold Spring Harbor (Melander). PENNSYLVANIA: Swarthmore, Delaware Co., Jack Run (Cresson).

Borborus Meigen.

Meigen: Illig. Mag., II. 276 (1803). Duda: Arch. f. Naturg. Abt. A. 4 (1923).

Black to brownish flies. Head hemispherical; mouth margin more or less produced; vibrissae strong; front broad, usually bristly; antennae short, third joint rounded or obtusely pointed, arista strong, pubescent or bare. Notum convex, narrowed anteriorly, lateral and posterior margins bristly; scutellum broad, triangular or trapezoidal, margin with some bristles. Abdomen with six to seven segments; male genitalia usually prominent. Legs moderately long, hind legs elongated; front and hind femora often incrassate; hind metatarsi usually thickened, shorter than the second tarsal joint; hind tibiae with an apical spur. Wings longer than the abdomen; crossveins widely separated; third vein not branched, third and fourth veins reaching wing-margin, fifth vein terminating at or some distance beyond outer crossvein, never reaching wing-margin; second basal and anal cells distinct. Genotype.—*B. equinus* Fallen.

GROUPS OF BORBORUS.

Buccal bristle strong; mesonotum with four rows of acrostichal setae between the dorsocentral rows; scutellum with four marginal bristles, rarely with six; hind tibiae with a distinct long and strong bristle on apical third of flexor surface; middle tibiae with a row of bristle-like setae on extensor surface. **armati** (Duda).

Buccal bristle weaker or entirely absent; mesonotum with but two rows of acrostichal setae between dorsocentral rows; scutellum with four or more marginal bristles; hind tibiae without a distinct bristle on apical third or flexor surface; middle tibiae with a distinct preapical bristle-like hair, never with a row of bristle-like setae .... **inermes** (Duda).

Subgenera of armati.

Hind tibiae with a distinct bristle-like hair on flexor surface near middle; antennae only slightly divergent; eyes large. **Crumomyia** Macq.

Hind tibiae without such bristle-like hair. .**Stratioborborus** Duda.

Borborus Species of Subgenus Crumomyia Macq.

1. Wings with heavy black markings along both outer and inner crossveins; inner crossvein at basal third of discal cell; dorsocentral bristles in three pairs; face and legs for the most part black; legs very hairy; abdomen very broad; large species 4 mm. Fig. 1 ....**immensus** n. sp.

Wings without such markings; inner crossvein a little beyond basal third of discal cell; one distinct pair of dorsocentral bristles present; face deeply concave in profile; lower margin of epistome curved up; labrum not produced; cheeks nearly half as high as eye; arista two and one-half times antennal length; acrostichal setulae short and numerous. *niger* Meig.

Borborus (Crumomyia) immensus n. sp. (Fig. 1.)

Subshining black. Front one and one-fourth times as broad as deep; divergent stripes velvety black; bristles long; fronto-orbital bristles nearly uniform in size; orbital setulae distinct, numerous; interfrontal bristles in six pairs, the anterior four pairs cruciate; cheeks slightly silvery pollinose, posterior portion glossy black; face deeply concave in profile; anterior margin of epistome distinctly curved up; labrum slightly produced; third joint of antennae rounded, more than two times as large as second; arista two and one-half times antennal length, sparsely pubescent; cheeks one-half as high as eye; buccae with a strong upcurved bristle and numerous irregularly arranged setae; oral setae long; vibrissae very long. Mesonotum lightly brownish pruinescent; dorsocentral bristles in three pairs; acrostichal setulae long, in six rows between the dorsocentral bristles; scutellum broad triangular, margined with four long bristles and two small, cruciate setae at apex; upper pleura pruinose; sternopleura glossy black, upper portion with two reduced bristles. Legs very long hairy, shining black, slightly grayish pollinose, with trochanters, knees, apices of tibiae and tarsi reddish brown; middle tibiae with a number of preapical bristles; hind femora long and slender, with a number of hair-like extensor bristles; hind tibiae with a very long hair-like bristle near apex; hind metatarsi but little thickened, nearly as long as next joint. Wings infumated, veins brown with heavy brownish markings on both outer and inner crossveins; second section of costa three and one-half times as long as third and six times as long as fourth; last section of second veins three and one-half times basal section of third vein; penultimate section of fourth vein one and one-half times basal section of third vein and three and one-half times outer crossvein; last sections of third and fourth veins slightly converging towards tip of wing; inner crossvein distinctly beyond basal third of discal cell; outer angle of discal cell short appendiculate. Abdomen broad; dorsum with numerous minute hairs; segments equal. Halteres dark fuscous. Length 4 mm.

Type.—Female: Hampton, N. H., March 8, 1904. S. A. Shaw, Collector; *Paratypes.*—Two specimens from Hampton, N. H. (Shaw) (C. W. Johnson collection).

Borborus (*Crumomyia*) *niger* Meigen.

Meigen: S. B. VI. 201 (1830). Duda: Arch. f. Naturg. 89. abt. A. 4. 64 (1923).

Dr. Hough identified material from Tifton, Georgia, as this species. This is the only evidence that this European species occurs in America.

Borborus Species of Subgenus Stratioborborus Duda.

1. Wings with heavy black markings along both inner and outer crossveins 2

Wings without such markings; inner crossvein at basal third of discal cell; labrum produced; arista a little more than three times antennal length; cheeks one-fourth as high as eye; mesonotum with three distinct pairs of dorsocentral bristles; acrostichal setulae long. Fig. 11 ....**setitibialis** n. sp.

2. Fifth vein ending at outer crossvein; arista long, six times as long as third antennal joint; halteres piceous; front femora swollen, bristly; middle tibiae with a distinct bristle at middle of flexor surface in addition to the usual extensor bristles; hind femora long, distinctly curved; hind tibiae long hairy. Fig. 2 .... *annulus* Walk.

Fifth vein produced beyond outer crossvein; halteres yellow; legs for the most part yellow or browned; hind femora shorter, straight; middle tibiae with stronger extensor bristle; hind tibiae with numerous long hairs on extensor surface; dorsocentral bristles strong. Fig. 6 .... **maculipennis** n. sp.

Borborus (Stratioborborus) setitibialis n. sp. (Fig. 11.)

Glossy black species. Front a little broader than long, the divergent stripes and lower front opaque velvety black, forming a distinct M-shaped mark; interfrontal bristles in five pairs; lower front setulose; antennae grayish, third joint rounded; arista a little more than three times antennal length, its pubescence becoming rather long toward tip; face and cheeks grayish; face concave; labrum produced; cheeks one-fourth as high as eye; oral margin with long hairs; buccae with four bristles, the anterior one very long and strong; vibrissae strong; eyes large. Mesonotum with three distinct pairs of dorsocentral bristles; acrostichal setulae long, in four rows; scutellum rather small, triangular; marginal bristles four; upper pleura opaque, grayish. Legs very hairy; coxae, trochanters, tibiae and tarsi brown; front femora incrassate; middle tibiae with six extensor and two flexor bristles; hind femora slightly swollen; hind metatarsi thickened, as long as the second joint. Abdomen rather long, tapering apically, venter yellowish; hypopygium hairy, slightly gray dusted. Wings brownish; veins brown; second section of costa three times third; third and fourth veins parallel; inner crossvein at basal third of discal cell; outer crossvein at three times its own length from inner, fifth vein extending a short distance from outer crossvein. Halteres yellow. Length 4 mm.

Holotype.—Male; Mt. Washington, New Hampshire. (Mrs. Slosson.)

Borborus (*Stratioborborus*) *annulus* Walker. (Fig. 2.)

Walker: List. IV. 1129 (1849).

A specimen from Pribilof Isl., Alaska, collected by T. Kincaid, is presumably this species.

Borborus (Stratioborborus) maculipennis n. sp. (Fig. 6.)

Shining black: Front three-fourths as deep as broad, opaque on divergent and lower orbital stripes; setigerous stripes and frontal triangle lightly pruinose; bristles well developed; fronto-orbital bristles divergent, nearly equal in size; orbital setulae in two rows, the inner two stronger than the outer, both extending above the upper fronto-orbital bristle; interfrontal bristles distinct, in five pairs, the anterior three pairs cruciate; divergent stripes with two bristles near anterior margin; face pale brown, deeply concave in profile, with brownish pruinescence; areas beneath antennae black; lower margin of epistome slightly curved up; clypeus broadly visible from in front; cheeks one-third as high as eye; anterior margins yellowish, upper portion pruinescent; vibrissae very strong; buccae with a strong upcurved anterior bristle and a few posterior hair-like setae; oral setulae distinct, becoming bristle-like at vibrissal angle; antennae very little divergent, third joint piceous, considerably larger than second; arista nearly four times antennal length, with rather long pubescence. Disc of mesonotum brownish; dorsocentral bristles in three pairs; acrostichal setulae long and hair-like, in six distinct rows between the dorsocentral bristles, middle acrostichals longer than the others; scutellum triangular; disc glossy; marginal bristles four; pleural sutures reddish; upper sternopleural bristles very much reduced. Legs long hairy, fuscous, with middle portions of middle and hind femora darker, front femora swollen, with a row of long hair-like bristles on lower surface; middle femora with two anterior bristles on apical third; middle tibiae with eight extensor and two flexor bristles; apical spur of hind tibiae strong; hind metatarsi thickened, three-fourths as long as third. Wings infumated with heavy brown markings along both outer and inner crossveins; veins brown; first section of costa with two long basal bristles; second section three and one-half times as long as third and five times fourth; inner crossvein beyond basal third of discal cell; basal section of third vein two-thirds as long as second section of fourth and two and one-half times outer crossvein; last section of third and fourth veins parallel; fifth vein extending a little more than half way to wing-margin from outer crossvein. Abdomen longer than thorax, hairy, tapering posteriorly; dorsum flattened; segments equal. Halteres yellow. Length 4–4.5 mm.

Type.—Male: Dewatto, Wash., Aug. 10, 1910 (Melander). *Paratypes.*—Six specimens from the following localities: WASHINGTON: Ilwaco (Melander-Spuler), Blaine, Tulalip (Melander). IDAHO: Moscow Mts. (Melander).

Subgenera of inermes.

1. Scutellum with four marginal bristles; hind tibiae with a distinct bristle near middle of flexor surface; apical spur as long as hind metatarsi .... *Borborillus* Duda.

Scutellum usually with fine, long hairs in addition to the four or more marginal bristles, hind tibiae always with a long, outwardly projecting, preapical, bristle-like hair; tibial spur smaller, about one-half as long as middle metatarsi. *Borborus* Meig.

Borborus Species of Subgenus Borborillus Duda.

1. Wings milky white; veins vitreous; eyes small 2

Wings hyaline or browned, veins browned; eyes normal 5

2. Inner crossvein at distinctly less than one-third from base of discal cell; third section of fourth vein distinctly longer than fourth; arista short 3

Inner crossvein at basal third of discal cell; third section of fourth vein as long as fourth; hind tibiae with long bristles on extensor surface 4

3. Eyes very small, barely higher than the cheeks from lower margin of eye to oral margin; face and cheeks yellow; front infuscate .... *lacteipennis* Mall.

Eyes larger; cheeks but little more than half as high as eye; face deeply excavated below antennae; antennae reddish brown; face and cheeks opaque piceous; notum with two indistinct fuscous stripes; dorsocentral bristles in one pair. Fig. 7 .... **frigipennis** n. sp.

4. Lower front and divergent stripes, face, cheeks and antennae reddish; mesonotum with three pairs of distinct dorsocentral bristles; legs dark fuscous with front and middle trochanters, knees and front and middle tarsi yellow; front femora swollen, with long bristle-like hairs; abdomen rather narrow, longer than thorax. Fig. 8 .... **peltastes** n. sp.

Black species; front shining black with velvety black M-shaped mark on central stripe; cheeks glossy black with lower half whitish pruinescence; legs black; front tarsi yellow; dorsocentral bristles weak, in four pairs; abdomen very short and broad .... *scriptus* Mall.

5. Notum yellow-cinereous pollinose, with distinct stripes; cheeks glossy black with a silvery pollinose area; face deeply excavated beneath antennae; second section of fourth vein less than one-third as long as third; third and fourth sections of fourth vein subequal. Fig. 13 .... *marmoratus* Beck.

Notum not striped, black or slightly gray-dusted 6

6. Front and hind femora distinctly swollen; hind tibiae with a double row of long hairs on extensor surface; all tarsal joints incrassate; legs black with knees and apex of femora slightly browned; cheeks about one-third as high as long diameter of eye; wings hyaline, veins yellow or pale brown; inner cross-vein but little before basal third of discal cell; third and fourth sections of fourth vein equal. Fig. 9. **singularis** n. sp.

Hind femora normal; hind tibiae without a double row of long hairs; eyes smaller; cheeks more than half as high as diameter of eye; greenish black species; front distinctly projecting .... *arcticus* Mall.

Boborus (*Borborillus*) *lacteipennis* Malloch.

Malloch: Proc. U. S. N. M. 44. 366 (1913). Described from Mexico.

Borborus (Borborillus) frigipennis n. sp. (Fig. 7.)

Opaque piceous. Front, at middle, not quite as broad as deep, reddish brown; vertex and ocellar triangle shining black; setigerous stripes and frontal triangle with a slight grayish sheen; bristles hair-like; fronto-orbital bristles widely divergent; inner margin of orbital stripe with a row of setae in addition to the usual orbital setulae; interfrontal setulae in six pairs, cruciate; divergent stripes with a single seta on anterior margin; face deeply excavated beneath antennae; slightly carinate; anterior margin reddish; anterior margin of epistome distinctly curved up; labrum not produced; cheeks shining, one-half as high as eye, lower margin with grayish pollen; buccae with a rather strong up-curved anterior seta and a few weak posterior setulae; oral setulae distinct; vibrissae strong; antennae reddish, with third joint very large and extending into the deeply excavated portions of the face; arista two times antennal length, sparsely pubescent. Mesonotum with two indistinct fuscous stripes; dorsocentral bristles in one pair; acrostichal setulae long, in four distinct rows; scutellum short and blunt; disc bare; marginal bristles four; pleura brown, sutures yellow; upper sternopleura with three weak bristles, increasing in size posteriorly. Legs brown, with coxae, trochanters and knees yellow; front, middle, and last three joints of hind tarsi whitish; hind tibiae with a prominent apical spur and a long hair-like, preapical flexor bristle; hind metatarsi thickened, almost as long as the next joint. Wings and veins milky white; second section of costa a little more than twice as long as third and three times fourth; inner crossvein before basal third of discal cell; basal section of third vein a little less than one-half as long as penultimate section of fourth vein, a little less than one-third as long as basal section of second vein and one and one-half times outer crossvein; last section of third and fourth veins parallel; fifth vein reaching a little more than half way to wing-margin from outer crossvein. Abdomen longer than thorax, dorsum flat with few weak hairs, second segment one and one-half times third. Halteres white. Length 2 mm.

Type.—Female: Lake Worth, Florida (Mrs. Slosson). *Paratypes.*—Four specimens from the same collection. The type specimen has been returned to the National Museum.

Borborus (Borborillus) peltastes n. sp. (Fig. 8.)

Opaque black. Front very distinctly produced above antennae, almost completely hiding antennae when viewed from above, three-fourths as broad as deep at middle; divergent stripes and lower frontal triangle reddish; setigerous stripes and ocellar triangle with a grayish sheen; bristles reduced; fronto-orbital bristles widely divergent, the lower slightly weaker than the upper; lower portion of orbital stripes with numerous hair-like setae; interfrontal setulae in six pairs, cruciate; face, cheeks and antennae reddish; face slightly carinate, deeply concave in profile; lower margin of epistome distinctly curved up; labrum not produced; third joint of antennae rounded, much larger than the second; arista two times antennal length, with microscopic pubescence; cheeks two-thirds as high as long axis of eye, blackened on posterior margin, lower anterior margin grayish pollinose; buccal and oral setulae weak; vibrissae strong; eyes rather small, oblique. Mesonotum with three pairs of dorsocentral bristles, the anterior two pairs considerably weaker than the posterior pair; acrostichal setulae short, in four rows; scutellum short, triangular; marginal bristles four; upper sternopleural bristles reduced, two in number, the posterior bristle almost twice as long as the anterior. Legs dark fuscous, with front and middle trochanters, knees, and front and middle tarsi yellowish; front femora thickened, with long hair-like bristles; middle tibiae with a few apical bristles; hind tibiae rather short, with a long hair-like extensor bristle; hind metatarsi as thick as tibiae, three-fourths as long as second joint. Wings whitish; costa pale brown; other veins pale yellow;

second section of costa two and one-half times third, and three and one-half times fourth; basal section of third vein one-fourth as long as last section of second vein, two-thirds as long as distance between crossveins and one and one-half times outer crossvein; last section of third and of fourth veins not convergent; last section of fifth vein extending half way to wing-margin; inner crossvein at basal third of discal cell. Abdomen long, tapering posteriorly; second segment two times third. Halteres white. Length 2.5–3 mm.

Type.—Male: Mobeste, Tex. (A. W. Barber). *Paratypes*.—Three specimens from the same collection. Coquillett reports this species to have been bred from a Scarabaeid beetle. The type specimen has been returned to the National Museum.

Borborus (*Borborillus*) *scriptus* Malloch.

Malloch: Bull. Brooklyn Ent. Soc. X. 64 (1915). Described from Illinois.

Borborus (*Borborillus*) *marmoratus* Becker. (Fig. 13.)

Becker: Mitt. Zool. Mus. Berlin, IV. 133 (1908). Duda: Arch. f. Naturg. 89 Abt. A. 4. 13 (1923).
minutus Johnson: Ann. Ent. Soc. Am. 6. 449 (1913).
brevisetus Malloch: Proc. U. S. N. M. 44, 365 (1913).

This species is quite common. One hundred and seventy-four specimens from the following localities have been examined: WASHINGTON: Chimacum, Pullman, Almota, Oroville, Spokane, Friday Harbor, Stevenson, Wawawai, Kennewick, Ilwaco, Union Flat, Centralia, LaCenter, Lake Crescent, Deer Park, Dewatto (Melander). IDAHO: Moscow, Avon, Coeur d'Alene, Kendrick, Lewiston (Melander). CALIFORNIA: Claremont (Aldrich), Palo Alto (Doane), Stanford U. (Aldrich), Mesa Grande (Cresson). BRITISH COLUMBIA: South Fork of Kokanee (Caudell). MONTANA: Lake McDonald, Glacier National Park (Melander). COLORADO: (Coquillett), Tabernish (Tucker). NEW MEXICO: Las Vegas (Barber). TEXAS: Plano (Tucker). KANSAS: Lawrence (Aldrich). MISSOURI: St. Louis (Warner). ILLINOIS: (Ill. Univ.), Chicago (Melander). PENNSYLVANIA: Chester Co., Delaware Co. (Cresson). MASSACHUSETTS: Horse Neck Beach (Hough), Forest Hills, Boston (Melander). NEW YORK: Cold Spring Harbor (Melander).

Borborus (Borborillus) singularis n. sp. (Fig. 9.)

Subshining black species. Front not produced above antennae, velvety black, with frontal triangle, and setigerous stripes silvery pollinose; face gray dusted, deeply excavated at middle, mouth-margin produced; cheeks one-third as high as long diameter of eye, glossy black, anterior margin gray dusted; buccal bristle distinct; eyes medium sized; antennae distinctly divergent; arista short, barely two times antennal length, pubescence short and dense; orbital bristles distinct. Mesonotum black, slightly gray dusted, dorsocentral bristles in four pairs; acrostichal setulae strong, in four rows between the dorsocentral rows; scutellum small, triangular, marginal bristles four; legs black, with knees and apex of tibiae slightly browned; front femora swollen; extensor surface with four distinct bristles, flexor surface with a row of hair-like bristles on apical half; middle tibiae with a number of apical bristles and a bristle on flexor surface near middle; hind femora distinctly swollen, hairy; hind tibiae with a double row of long hairs in addition to a distinct preapical bristle on extensor surface and a long bristle on apical third of flexor surface; all tarsi more or less incrassate. Wings hyaline, veins pale brown; inner crossvein slightly before basal third of discal cell; third and fourth sections of fourth vein equal or nearly so; fifth vein extending half way to wing margin. Abdomen dull black, second segment as long as the next three, base on dorsum; lateral margins of all segments with some bristles; dorsal surface of fifth and sixth segments with small bristles; hypopygium prominent, distinctly hairy. Halteres white. Length 2 mm.

Type.—Male: Kettle Falls, Washington (Melander).

Borborus (*Borborillus*) *arcticus* Malloch.

Malloch: Proc. U. S. N. M. 44. 367 (1913). Described from one female from Ungava Bay and one male and one female from Fort Chimo, Hudson Bay.

Borborus Species of Subgenus Borborus.

1. Notum with four broad olivaceous, and three narrow grayish indistinct longitudinal stripes; arista almost bare; inner crossvein distinctly beyond basal third of discal cell; third section of fourth vein slightly shorter than fourth; lower front reddish. Fig. 5 .... *equinus* Fall.

Notum without such markings; third section of fourth vein distinctly longer than fourth 2

2. Scutellum with six marginal bristles, disc bare; lower front reddish; wings browned, with heavy markings along veins, veins black; legs black with coxae, trochanters, bases and apices of femora, tibiae and tarsi pale yellow. Fig. 3.
calcitrans n. sp.

Scutellum with four marginal bristles and a number of marginal hairs 3

3. Disc of scutellum bare; front with a distinct M-shaped reddish mark; face dusty yellow; labrum produced; dorsocentral bristles strong; legs with coxae, trochanters, bases and apices of femora, tibiae and tarsi yellow; abdomen broad, short, almost circular in outline, dorsum bare. Fig. 10.
neglectus Mall.

Disc of scutellum with a number of hairs; lower front reddish; wings hyaline or slightly browned; veins pale brown; legs black with knees, tibiae for the most part and tarsi reddish to yellow. Fig. 4 ....*nigrofemoratus* Macq.

Borborus (*Borborus*) *equinus* Fallen. (Fig. 5.)

Fallen: Dipt. Suec. Heterom. 6. (1820). (*Copromyza.*)
Duda: Arch. f. Naturg. 89 abt. A. 4. 93 (1923).

This is one of the most common of all species of Borboridae. Collections from the various parts of North America produced them. Eight hundred forty specimens from the following localities have been examined: IDAHO: Troy, Moscow Mts., Chatcolet (Melander). WASHINGTON: Bellingham, Pullman, Mt. Constitution, Union Flat, Kennewick, Centralia, Nahcotta, Lake Crescent, LaCenter, Deer Park, Olga, Palouse, Chehalis, Chimacum (Melander), Ilwaco (Melander-Spuler), Grand Coulee (Doane). CALIFORNIA: Berkeley (Cresson), Alameda (Cresson-Doane), Mesa Grande (Baumberger), Sta. Clara Co. (Coleman), Redwood Canyon (Cresson), Palo Alto, Stanford University (Doane). BRITISH COLUMBIA: South Fork, Kokanee Mt. (Caudell). OREGON: Hood River, Salem (Melander). MONTANA: Lake McDonald, Glacier National Park (Melander). WYOMING: Sheridan (Metz). TEXAS: College Station (Webster). INDIANA: Lafayette (Melander). OHIO: Columbus, Waseon, Defiance, Medina (Hine). WISCONSIN: Milwaukee Co. (Brues). ILLINOIS: (Ill. Univ.), (U. S. N. M.). KANSAS: Douglas (Snow), Lawrence (Tucker). MISSOURI: St. Louis (Warner). MISSISSIPPI: (U. S. N. M.). MASSACHUSETTS: Greenfield, Boston, New Bedford (Melander). QUEBEC: St. Johns Co. PENNSYLVANIA: Swarthmore, Jack Run (Cresson). NEW YORK: Cold Spring Harbor (Melander).

Borborus (Borborus) calcitrans n. sp. (Fig. 3.)

Shining black, slightly brownish pruinose. Front two-thirds as long as broad; the divergent stripes depressed, opaque, slightly reddish anteriorly and merging to black at vertex; interfrontal setulae very weak; four in number, not extending up to the lower fronto-orbital bristle and not cruciate; lower portion of divergent stripes with numerous setulae; fronto-orbital bristles widely divergent, uniform in size; face piceous, reddish between the antennae, lateral margins glossy black, shallowly and uniformly concave in profile; labrum distinctly produced, slightly reddish; cheeks, at vibrissal angle, two-fifths as high as eye, with a posterior glossy black spot below eye; vibrissae strong; buccae and oral margin with weak setulae; antennae large; basal joints black; third joint piceous, much larger than the second; arista pubescent, two and one-half times antennal length. Mesonotum with three pairs of dorsocentral bristles, the anterior two pairs rather indistinct; acrostichal hairs rather long, arranged in four distinct rows; scutellum triangular, with six marginal bristles, the middle pair hair-like, weaker than the others, disc bare; lower pleura glossy black. Legs with coxae, trochanters, bases and apices of femora narrowly, bases of tibiae broadly, apices of tibiae and basal joints of tarsi reddish brown; front femora slightly swollen; hind femora long and slender; middle tibiae with a single flexor bristle on apical third and about six apical bristles; hind tibiae with a single long, hair-like bristle on outer side near apex, nearly as long as the slightly thickened second joint. Wings distinctly browned, veins piceous; costa with minute setulae, first section three-fifths as long as second, third section one and one-fourth times fourth and one-third as long as second; inner crossvein at slightly before basal third of discal cell; third section distinctly longer than fourth; outer angle of discal cell rounded; third and fourth veins not converging toward tip of wing. Abdomen broad, almost bare, lateral margin with a few hairs; second segment elongated. Halteres testaceous. Length: 4 mm.

Type.—Female: Pullman, Wash. (W. M. Mann). *Paratype.*—A single specimen collected by G. I. Reeves at Pullman, Wash.

Borborus (*Borborus*) *neglectus* Malloch. (Fig. 10.)

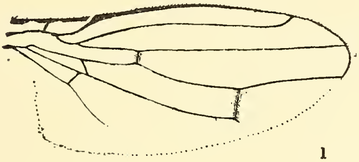
Malloch: Proc. U. S. N. M. 44. 364 (1913).

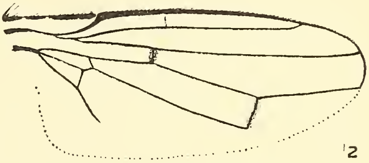
Described from one female specimen from Beverley, Mass. Three specimens from Pullman, Wash. (Mann), agree with Malloch's description of this species.

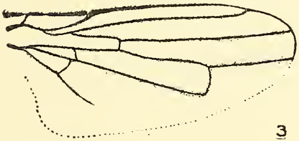
Borborus (*Borborus*) *nigrofemoratus* Macq. (Fig. 4.)

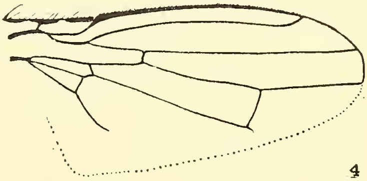
Stenhammar: Coprom. Scand. 346. (88) (1885). (*Copromyza*). Duda: Arch. f. Naturg. 85. abt. A. 4. 22 (1923).

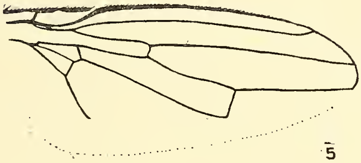
A single specimen from Corvallis, Ore., from the collection of A. L. Melander, agrees with this species.

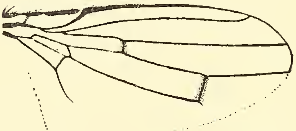

1

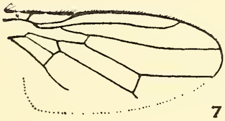

2

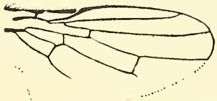

3

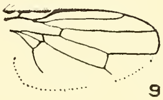

4

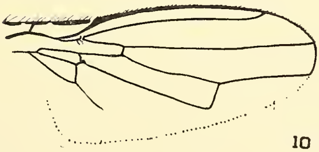

5

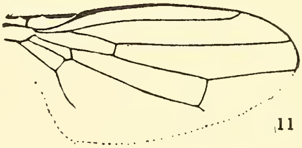

6

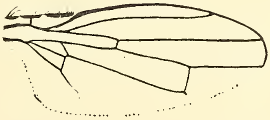

7

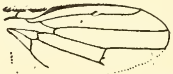

8


9


10


11


12


13

EXPLANATION OF PLATE.

Fig. 1. *B.* (*Crumomyia*) *immensus* n. sp.
Fig. 2. *B.* (*Stratioborborus*) *annulus* Walk.
Fig. 3. *B.* (*Borborus*) *calcitrans* n. sp.
Fig. 4. *B.* (*Borborus*) *nigrofemoratus* Macq.
Fig. 5. *B.* (*Borborus*) *equinus* Fall.
Fig. 6. *B.* (*Stratioborborus*) *maculipennis* n. sp.
Fig. 7. *B.* (*Borborillus*) *frigipennis* n. sp.
Fig. 8. *B.* (*Borborillus*) *peltastes* n. sp.
Fig. 9. *B.* (*Borborillus*) *singularis* n. sp.
Fig. 10. *B.* (*Borborus*) *neglectus* Mall.
Fig. 11. *B.* (*Stratioborborus*) *setitibialis* n. sp.
Fig. 12. *Scatophora carolinensis* Rob.-Des.
Fig. 13. *B.* (*Borborillus*) *marmoratus* Beck.

The Third International Congress of Entomology will be held at Zurich, Switzerland, July 19th to 26th, 1925, with Dr. A. V. Schulthess as president. General Secretary Dr. Leuzinger, Gloriastrasse 72, Zurich, 7, Switzerland. All entomologists are cordially invited.

For the Executive Committee,
HENRY SKINNER.

* * *

The first and second congresses held at Brussels and Oxford, respectively, were very successful and it is now proposed to hold the Third Congress in a neutral country where entomologists of the belligerent countries could meet without embarrassment, and Switzerland has been suggested as a suitable place and attractive in many ways and convenient for the majority.

Hydrometra australis Say in New York State. (Hemip.)—A winged male of this species, collected by Mr. Bueno and myself at White Plains, N. Y., 19. IX. 1919, has stood in my collection for more than five years under another name, and only recently was its true identity recognized. This species was originally described from Louisiana, has since been recorded from Kansas, Florida, and Georgia, and I have seen a specimen from North Carolina. The New York record extends its known range very remarkably.—R. F. Hussey, N. York, N. Y.

NOTES ON SOME NORTH AMERICAN CORIXIDS FROM THE SOUTHWEST.

By H. B. Hungerford, Department of Entomology, University of Kansas, Lawrence, Kansas.

It has been many years since there has been any study of the Corixidae from the southwestern portion of North America. Say, Uhler and Champion studied species from Central America, Mexico, and the southwestern United States, but since their time little attention has been given to these insects in this part of North America. Doctor Francis Huntington Snow, formerly Chancellor of the Kansas University, made several collecting trips into New Mexico and Arizona many years ago. He captured quite a number of Corixids that have reposed in our cabinets through these years without being determined. Other interesting species have come into my hand from time to time. Mrs. Grace Olive Wiley has collected a great many insects for me in Texas, Colorado and Utah. Some material has been found in the collections gathered together by Doctor Abbott and transmitted to me by Mr. J. R. de la Torre Bueno and still other specimens have been sent to me by other friends.

In this paper I shall report mainly upon the Corixidae taken by Doctor Snow, whose material has been neglected for so many years. This lot contains a new species which must be assigned to a new genus. A few new records and new species are added from the more recent collections in the southwest. In order to save space the report is made species by species although there has been a temptation to separate the Snow material from the others.

Arctocorixa laevigata (Uhler).

In Doctor Snow's material are two lots—one bearing the label, " Douglas, Arizona, Aug., F. H. Snow," and the other, " San Bernardino Ranch, Cochise Co., Ariz., 9,750 ft., Aug., F. H. Snow." This is a new record for Arizona. Another new record of this species in my collection was made by Mrs. Grace Wiley in Colorado County, Texas, in 1922. She also sent me a very long series from Emery County, Utah. I can add Moscow, Idaho, as another new record in the distribution of this large Corixid.

Arctocorixa serrulata (Uhler).

This unique and strikingly marked Corixid is found in Doctor Snow's collections bearing the following labels:

"Tucson, Ariz., F. H. Snow,"
"Baboquivaria Mts., Arizona, F. H. Snow,"
"Santa Rita Mts., Ariz. 5 to 8,000 ft., June, F. H. Snow,"
"Bill Wms. Fork, Ariz., Aug., F. H. Snow."
Uhler described this species from Arizona.

Arctocorixa abdominalis (Say).

Doctor Snow's insects of this species were collected in the Baboquivaria Mountains, Arizona. I have two recent collections of this species. One from Kane County, Utah, by Doctor R. C. Moore and the other from Superstition Mountains, Arizona, collected for me by P. A. Glick. There are two undescribed species that have been confused with *Arctocorixa abdominalis* (Say). Both were collected in California. The descriptions follow:

Arctocorixa californica sp. n.

Size: 10 mm. long; width across head about 3 mm. Size, therefore, large and about the same as that of *Arctocorixa abdominalis* (Say).

Color: Dark above, more or less yellow below, not pink as in *A. abdominalis* (Say). Pronotum, clavus and corium strongly rastrate, surface appearing rough. Pronotum crossed by about eighteen pale lines that are somewhat irregular and incomplete and about as wide as the intervening dark lines. Clavus and corium crossed by parallel, continuous, wavy lines; those at base of clavus broadest, those at middle of clavus somewhat broken. Membrane provided throughout with short, slender, undulate, pale lines. Basal half of embolium pale. Irregular sooty patch at embolial suture, most of margin checkered. Prosternum and coxae more or less dusky. Ventral side of abdomen yellow, sutural lines and margin dusky.

Structural characters: The so-called beak reduced. Face in both sexes with a large, dense patch of long, silvery hair. The head is usually yellow in color, but the area beneath this large mat of hair is usually dark. Eyes, frons and pronotum more strikingly defined in male than in female. Faint median longitudinal carina on pronotum, more distinct in anterior portion. Margin of tegmina broadly explanate and margin upturned. Front femur not triangularly expanded at base, but provided with tufts of long hairs. Pala long and slender, its base no broader than tibia to which it is attached and tapering to tip which is provided with a stout claw. Pala of male more slender than that of female and provided on its inner face (which is exceedingly narrow) with a row of thirty-two pegs extending from base to tip. Middle and hind legs stout. Strigil of male quadrate, twelve striae. Genital capsule of male as shown in Fig. 10, Plate II.

Comparative notes: This species is very much like *A. abdominalis* (Say). The palae in both sexes are more slender, however, and the surface of pronotum and tegmina more rastrate. Strigil present and well developed in male, whereas in *A. abdominalis* (Say) it is absent. Described from 18 specimens from California. Holotype and allotype in Kansas University collection. Paratypes in Stanford University, United States National Museum and the private collection of J. R. de la Torre Bueno.

Arctocorixa uhleri sp. n.

Size: 8.5 to 9 mm. long.

Color: General color light above due to the broad pale yellow lines especially pronounced on pronotum. Clavus and corium sometimes clouded, or suffused with black. Head and legs pale. Sternal sclerites, coxae, trochanters and base of femora black. Ventral part of abdomen yellow in female, black in male. Yellow bands of pronotum twice as broad as the black which are slender, somewhat furcate and uneven. Yellow bands on base of clavus broad. Clavus and corium crossed by continuous wavy bands. Membrane covered throughout by irregular zig-zag yellow lines.

Structural characters: So-called beak reduced as in *A. californica.* Face provided with large dense patch of long silvery hair. Pala slender, shaped as in *A. californica,* but provided with 25 or 26 pegs only. Strigil large, circular. Rows of striae very irregular. Genital capsule as in drawing.

Comparative note: This species is smaller than *A. californica* sp. n., and considerably lighter in color; rastrations on tegmina less marked; strigil of male relatively larger and claspers of different shape as shown in drawing. Fig. 9, Plate II.

Described from four specimens from the Uhler collection at Washington. They bear the label "San Bernardino, Calif." Holotype and allotype in the United States National Museum at Washington, D. C.

Neocorixa genus nov.

In Doctor Snow's collection is a series of insects labeled "Santa Rita Mts., Ariz. 5 to 8,000 ft. June, F. H. Snow." These belong to a unique species having rastrated pronotum and tegmina and the male strigil situated on the left side. This species is so unrelated to *Trichocorixa* (= *Corixa* of former American authors) that it is necessary to propose the new genus name **Neocorixa** and designate the species described below as the genotype.

Neocorixa snowi sp. n.

Size: Length 7.5 mm.; width of head about 2.4 mm.

Color: General color dark, both dorsum and venter. Head and legs yellow. Pale patches on the sides of each thoracic segment. Tegmina roughened by irregular rastrations. Pronotum crossed by 16 or more, more or less broken and coalescing pale lines which are about as wide as the intermediate dark stripes. Except at the base of the clavus the pale, finely zig-zag lines are narrower than the dark ones and the sculpturing of the tegmina is such that they appear as elevated cross ridges. The slender, pale lines of membrane are more or less broken, but nevertheless give a cross bar effect. In many specimens the pattern of both clavus and corium is obscured by dark brown. Suture of embolium covered by large sooty blotch.

Structural characters: The so-called beak reduced. Frontal depressions of male oval, not reaching the eyes. Eyes in both sexes prominent. Lower margin of basal half of front femor of male provided with row of strong spines.[1] Front tarsus long, slender, tapering to a single stout claw in both sexes. The male pala provided with about 32 pegs arranged in a row along the lower margin. Strigil of male on left side consisting of a curious patch of short hook-like projections not arranged conspicuously in rows. The projections along the anterior and mesal margin are long and spine-like and directed mesally. Genital capsule as shown in drawing on Plate II, Fig. 8.

Described from eight specimens (4 males and 4 females) bearing the label: "Santa Rita Mts., Ariz. 5 to 8,000 ft., June, F. H. Snow." Holotype, allotype, and paratypes in Kansas University Entomological Collections.

Notes: This species is much like Champion's *A. unguiculata,* but has the asymmetry of the male on opposite side.

In this connection I may say, I have examined Kirkaldy's type of *Arctocorixa melanogaster,* a male from Costa Rica and compared it with a Champion type of *A. unguiculata.* The two are identical. In Kirkaldy's type both front claws are gone from the palae. Since Kirkaldy failed to mention a prominent claw on the pala of his species Dr. Champion concluded that his own *C. unguiculata* with its prominent claw must be different. *A. unguiculata* (Champion) 1901 is, therefore, a synonym of *A. melanogaster* Kirkaldy, 1899. Another synonymic note I desire to mention here concerns *Corixa femorata* Guér. This species was placed with some doubt by Dr. Champion as a synonym of *Corixa abdominalis* Say. Kirkaldy and Bueno in their "Catalogue of American Aquatic and Semi-aquatic Hemiptera" omitted this species altogether. While Guérin's description is short, I am very sure his *C. femorata* is quite unrelated to *A. abdominalis* (Say). I have a species that comes from Mexico that is much smaller than *A. abdominalis* (Say). It has huge femora that are triangularly produced at base and which I am convinced is the true *Corixa femorata*[2] of Guérin. Failure to recognize this species, I believe, has been due to the fact that the insects themselves never came before the eyes of other workers. The structures on the front legs and beak of the male are so prominent and their operation so obvious that drawings are submitted for the benefit of those interested in the subject of stridulation among insects. On Plate I is shown a face view of the male. Note the strongly chitinized margin at the base of the beak (strong black line) and the rows of stout pegs on the femur.

---

[1] Often broken off.

Another new species quite near *A. melanogaster* Kirk., yet distinct from it in color pattern and structure, is represented by a male specimen taken by W. J. Gerhard which bears the label, "Gilla River, N. M., VII: 9."

Arctocorixa gerhardi sp. n.

Size: Nearly 8 mm. long.

Shape: Very much as in *A. melanogaster* Kirk.

Color: Dark. The yellow lines relatively narrower than in *A. melanogaster* Kirk. Pale lines slightly narrower than dark ones on pronotum. Elsewhere they are plainly narrower except on base of clavus. Pronotum crossed by 8 or 9 yellow bands. On tegmina the undulate pale cross bands are more or less broken and on corium half as wide as the dark ones. The pale lines of membrane much broken. Head, limbs and venter yellow.

---

[2] [= *Arctocorixa femorata* (Guérin)].

Structure: Frontal depression of male shallow. Pala of male narrow, equipped with row of about 25 pegs. Femur expanded and angulate at base. Strigil of male minute and at the tip of a strongly chitinized process which is bulbous at base. Genital capsule as shown in drawing on Plate II, Fig. 1.

Notes: Compared with *A. melanogaster,* the pale bands are narrower, the vertex of head in male more pronounced and the metaxyphus not so long and narrow.

Two very interesting species were collected for me by Mrs. Grace Wiley, one in Texas and the other in Utah.

Arctocorixa compacta sp. n.

Size: 7 mm. long; 2.3 mm. across eyes; 3 mm. greatest body width. Males slightly narrower than above measurements.

Shape: Very compact, relatively broad species. Quite readily distinguished by this characteristic.

Color: Pattern as a whole indistinct. The markings on tegmina often faint. The pronotum crossed by 7 or 8 dark brown bands which are sometimes somewhat broken. The yellow bands slightly wider than the brown. On the tegmina the pale bands are twice as broad as the dark ones, both of which are frequently nearly obliterated, leaving an almost hyaline corium. Head, limbs and venter yellow. The latter sometimes dark.

Structure: Head very short and broad. Pronotum and clavus rastrate. Corium shiny. Frontal depression scarcely discernible in male. Front femur not much thickened at base. Pala as shown in drawing on Plate II, Figs. 2, 3 and 4. Strigil of male lacking (see Plate II, Fig. 6). Genital capsule of male as shown on Plate II, Fig. 5.

Described from 255 specimens from Eastland County, Texas, taken in May, 1921, by Mrs. Grace Olive Wiley.

Holotype, allotype, and many paratypes in University of Kansas collection. Paratypes sent to Mrs. Wiley, Mr. J. R. de la Torre Bueno, Mr. William E. Hoffman, Dr. H. M. Parshley, Dr. R. F. Hussey, and the United States National Museum.

Arctocorixa utahensis sp. n.

Size: 7.3 mm. long; 2.1 mm. across eyes; greatest body width 2.5 mm.

Shape: Rather slender.

Color: General color light. The pale straw yellow dominant over the brown bands which are slender. The pronotum crossed by ten very thin dark lines. The slender brown lines of tegmina broken and furcate. The pattern of membrane continuous with that of corium. Base of clavus slightly paler in some than in others. Head, limbs and ventral side of body yellow. In some males the first three abdominal segments are black beneath.

Structure: Frontal depression of male oval, its sides touching the inner margins of the eyes. Vertex prominent. Pala of male broad, provided with an angulate row of about 25 pegs, the distal ones of which are long. Pala of female slender. The metaxyphus in both sexes reduced. Genital capsule of male as shown on Plate II, Fig. 7.

Described from 34 specimens taken by Grace Olive Wiley in Emery County, Utah, in July, Aug. and Sept., 1921. Holotype, allotype and some paratypes in Kansas University Collection. Paratypes also in United States National Museum and private collections of Mrs. Grace Wiley, Mr. J. R. de la Torre Büeno and Dr. R. F. Hussey.

Note: This species has the general facies of several other species from the southwest, but is readily distinguished by its structural characters.

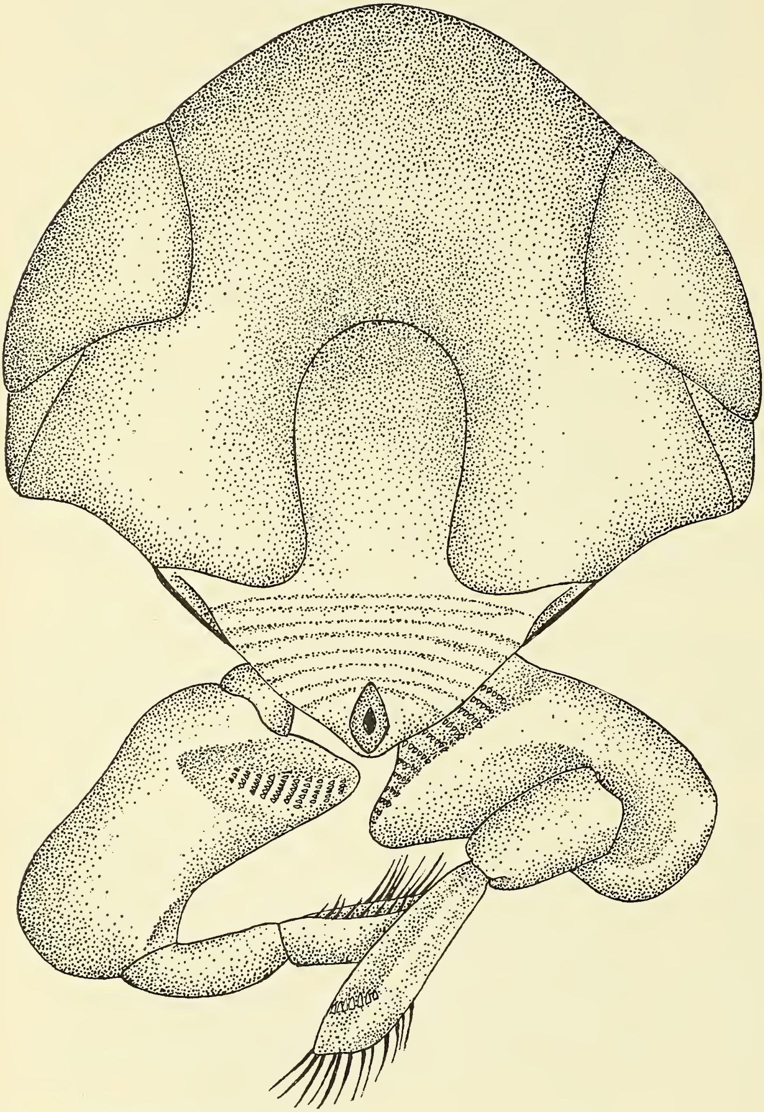
PLATE I.

Arctocorixa femorata (Guérin). Head and front legs of male (cephalic view). Note the heavily chitinized margin of the beak and the thickened femora with their rows of stridular pegs. Without doubt these modifications are for the purpose of sound production.

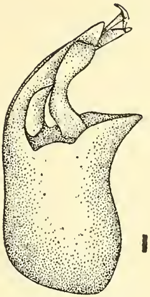
PLATE II.

Figure 1. Genital capsule of male of *Arctocorixa gerhardi* sp. n.
Figure 2. Outside view of pala of female of *A. compacta* sp. n.
Figure 3. Outside view of pala male of *A. compacta* sp. n.
Figure 4. Inside view of pala of male of *A. compacta* sp. n.
Figure 5. Genital capsule of male of *A. compacta* sp. n.
Figure 6. Dorsal view of abdomen of male of *A. compacta* sp. n.
Figure 7. Genital capsule of *Arctocorixa utahensis* sp. n.
Figure 8. Genital capsule of male of *Neocorixa snowi* sp. n.
Figure 9. Genital capsule of male of *Arctocorixa uhleri* sp. n.
Figure 10. Genital capsule of male of *Arctocorixa californica* sp. n.

In the above drawings of the male genital capsules note the differences in the right claspers. Note also that *Neocorixa snowi* sp. n. has a capsule that is just the reverse of the others.

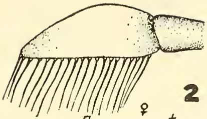


Kathleen Doering del.



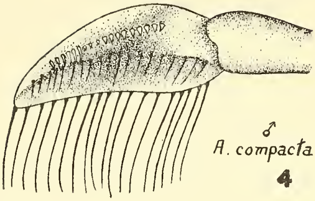
1

A. gerhardi



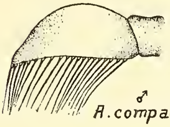
2

♀ A. compacta



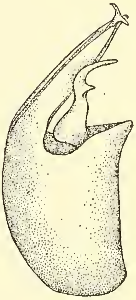
♂ A. compacta

4



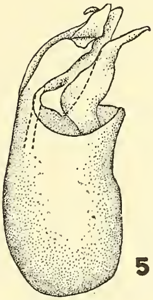
3

♂ A. compacta



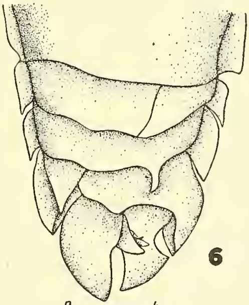
A. utahensis

7



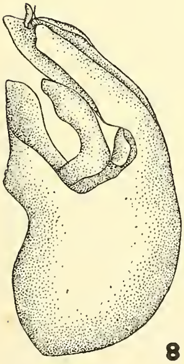
5

A. compacta



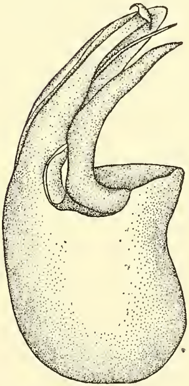
6

A. compacta



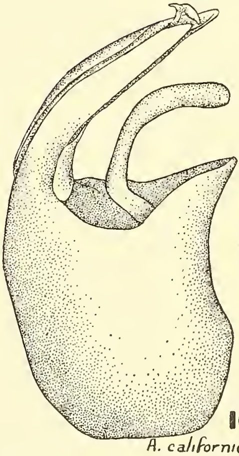
8

N. snowi



A. uhleri

9



10

A. californica

Kathleen Doering del.

FOUR NEW PHLŒOTHRIPIDÆ (THYSANOPTERA) FROM NEW YORK.

By J. Douglas Hood, University of Rochester.

Hindsiana dodgei sp. nov.

Female (macropterous).—Length about 1.7 mm. Color yellow, with head, thorax, and apical abdominal segments brown, head darkest anteriorly; legs yellow, with femora darkened with brown on outer surface; antennae with segment 1, base and sides of 2, and all of 5–8 about concolorous with head, sometimes more yellowish basally; remainder of 2 and all of 3 yellow, somewhat darkened with brown; 4 brownish yellow; wings of both pairs yellowish gray, darkest along margins, distal portion of hind wings darkest in posterior half; subhypodermal pigmentation orange by reflected light, brown by transmitted light, that in abdomen disposed largely at sides.

Head about one and one-third times as long as wide, broadest slightly behind eyes, thence narrowed to base, which is about 0.8 the greatest width, cheeks nearly straight; dorsal and lateral surfaces without sculpture, bristles minute and barely visible; vertex evenly declivous, not at all produced nor overhanging; postocular bristles longer than eyes, pointed, situated close to sides of head. Eyes about 0.31 as long as head, hardly half as wide as their interval, rounded but not protruding. Ocelli of posterior pair very widely separated, nearly touching eyes; anterior ocellus directed more nearly upward than forward. Antennae nearly 1.9 times as long as head, of the general form and structure common to the genus, segments 7 and 8 broadly united; sense cones: 3, 1–1; 4, 1–2; 5, $1–1^{+1}$; 6, $1–1^{+1}$; 7 with one on dorsum near apex. Mouth cone blunt, less than half as long as greatest width of head, not attaining middle of prosternum.

Prothorax 0.7 as long as head and (inclusive of coxae) about 1.9 times as wide as long, with evident median thickening; surface smooth; anterior marginal bristles minute, anterior angulars half as long as others, which are about equal in length to postoculars, yellowish and pointed, excepting outer pair at posterior angles, which are slightly dilated at tip; coxal bristles shorter, pointed. Pterothorax about equal in width to prothorax, sides nearly parallel in anterior half, roundly converging posteriorly. Legs moderately short, fore and hind femora somewhat swollen, fore tarsus unarmed, but with a prominently projecting claw on inner surface. Wings of fore pair not narrowed at middle and without accessory hairs on posterior margin; outer subbasal bristle long and pointed, others shorter and somewhat dilated at tip.

Abdomen of normal form; tube about 0.6 as long as head, twice as long as basal width, and twice as wide at base as at apex. Abdominal bristles pointed, yellow, those at apex of segment 9 about 1.5 times as long as tube; terminal bristles more than twice the length of the tube, brown.

Measurements of holotype (♀): Length 1.71 mm.; head, length 0.24 mm., greatest width 0.18 mm., width at base 0.14 mm.; eyes, length 0.076 mm., width 0.042 mm., interval 0.090 mm.; postocular bristles, length 0.087 mm.; prothorax, length 0.17 mm., width (inclusive of coxae) 0.31 mm.; pterothorax, width 0.32 mm.; abdomen, width 0.35 mm.; tube, length 0.14 mm., width at base 0.074 mm., at apex 0.037 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	45	57	63	63	60	57	57	37
Width (μ)	43	31	35	34	30	27	23	15

Total length of antenna 0.44 mm.

Male (brachypterous).—Color much paler than in female; head nearly yellow in posterior half, prothorax dark brown, pterothorax paler, especially at middle, legs less shaded with brown, 9th and 10th abdominal segments abruptly dark brown; segment 1 of antenna concolorous with head, 2–4 yellow, 4 often more or less overcast with grayish, 5–8 successively darker. Eyes small. Median ocellus exceedingly minute, others wanting. Pterothorax much narrower than prothorax. Fore tarsus unarmed, but with the usual prominent claw on inner surface.

Described from two females and three males taken by the writer near Macedon, New York, May 4, 1924, under dead elder bark.

This is a very pretty species and one which may easily be recognized by the coloration and the long, pointed bristles. The form of the fore wings would appear to exclude it from the genus to which I have assigned it; but in all other respects it agrees well with its congeners.

It is named after Prof. Charles Wright Dodge, of the University of Rochester, who has accorded me every possible facility and encouragement for the prosecution of entomological work.

Hindsiana pullata sp. nov.

Female (apterous).—Length about 1.25 mm. Color dark blackish brown (nearly black), with extreme tips of all femora nearly colorless; inner and outer surfaces of femora and basal portions of tibae nearly black; antennae nearly black, but with segments 1 and 2 paler, particularly the apical portion of 2, and with pedicel of 3 pale brownish yellow; subhypodermal pigmentation maroon-red.

Head about one and one-fourth times as long as wide, broadest behind eyes, cheeks slightly arched but nearly parallel; surface free of sculpture, except at extreme base, where there are one or two very faint, anastomosing striae; vertex roundly produced in front of eyes, very slightly overhanging insertion of antennae; postocular bristles very long, nearly twice the length of eyes, slender and pointed, dark in color. Eyes as wide as long and as wide as their interval, slightly projecting beyond the general outline of head. Ocelli wanting. Antennae more than twice as long as head, inserted beneath vertex, unusual in that segment 8 is lanceolate, decidedly narrowed toward base, but not pedicellate. Mouth cone blunt, broadly rounded, about attaining middle of prosternum, labrum not surpassing labium, palpi very short.

Prothorax about 0.85 as long as head and (inclusive of coxae) twice as wide as long, surface devoid of sculpture, sides distinctly concave; midlateral bristles minute, all others long and pointed, anterior marginals shortest, inner pair at posterior angles longest and comparable with postoculars. Pterothorax, slightly narrower than prothorax, sides nearly parallel. Legs moderately slender; fore tarsi unarmed save for the usual claw on the inner surface.

Abdomen about one and one-third times as wide as prothorax. Tube short and broad, about 0.56 as long as head and 1.58 times as long as basal width; sides abruptly converging in basal fifth, slightly concave beyond. Abdominal bristles all pointed, dark in color, terminal bristles longer than tube.

Measurements of holotype (♀): Length 1.25 mm.; head, length 0.192 mm., width 0.156 mm.; eyes, length 0.048 mm., width 0.048 mm., interval 0.048 mm.; postocular bristles, length 0.090 mm.; prothorax, length 0.132 mm., width (inclusive of coxae) 0.263 mm.; pterothorax, width 0.246 mm.; abdomen, width 0.350 mm.; tube, length 0.103 mm., width at base 0.065 mm., at apex 0.038 mm.; terminal bristles, length 0.120 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	39	54	55	56	58	55	50	44
Width (μ)	32	34	28	32	30	26	25	16

Total length of antenna 0.411 mm.

Described from one female, taken by the writer under a loose scale of bark on a living apple tree, near Macedon, New York, January 23, 1924. Seen under a hand lens the living insect was jet black and highly polished. Careful search on many subsequent occasions has failed to reveal further specimens.

An unusual species, not only in the coloration of the antennae and legs, but also in the long postocular bristles, the entire absence of ocelli, the lanceolate terminal segment of the antennae, and the short, broad tube. The pale knees and habitat suggest *Rhynchothrips,* but the mouth cone is of the *Haplothrips* type. Its assignment to *Hindsiana* is to be considered provisional only.

Trichothrips fumiceps sp. nov.

Female (brachypterous).—Length about 1.9 mm. Color brownish yellow, with head, prothorax, sides of pterothorax, and terminal abdominal segments (except tube) darkened with blackish brown, the head darkest; tube yellow, tipped with gray; segment 1 of antennae concolorous with head, 2 lighter, especially toward apex, 3 yellow, 4 shaded with darker at tip, 5–8 grayish, the segments often successively darker; subhypodermal pigmentation orange-yellow by reflected light, brown by transmitted light.

Head slightly broader than long, sides straight, very slightly converging posteriorly; occipital region faintly subreticulate and with the usual minute bristles; postocular bristles about half as long as head, pointed. Eyes small, directed forward, only about one-fifth the length of the head, and about one-third as wide as their interval. Anterior ocellus situated well down toward antennae, directed slightly forward, and somewhat overhanging; posterior ocelli wanting. Antennae distinctly more than twice the length of the head; segment 1 large and tapering to apex; 2 longer and narrower than 1; 3 the longest, subconical; 4–6 equal in length, pedicellate; 7 shorter, pedicellate; 8 longer than 7, lanceolate, pedicellate; sense cones: 3, 1–2; 4, 2–2; 5, $1-1^{+1}$; 6, $1-1^{+1}$; 7 with one on *outer angle.* Mouth cone broadly rounded at apex, reaching nearly across prosternum; labrum acutely pointed, slightly surpassing labium.

Prothorax slightly longer than head and (inclusive of coxae) about 1.8 times as wide as long; anterior marginal bristles minute; anterior angulars distinct, but short; others long, pointed, subequal to coxal, fully as long as postoculars and four or five times as long as anterior angulars. Pterothorax slightly narrower than prothorax, sides almost parallel, except for the projecting anterior angles. Wings indistinguishable. Fore tarsus with a long, stout, straight tooth.

Abdomen normal, slightly wider than prothorax. Tube (measured along ventral surface) nearly as long as head, somewhat more than twice as long as basal width, and more than twice as broad at base as at apex. Bristles long and pointed, those on the ninth segment almost as long as the tube; terminal bristles fully two-thirds the length of the tube.

Measurements of holotype (♀): Length 1.91 mm.; head, length 0.195 mm., width 0.206 mm.; eyes, length 0.040 mm., width 0.036 mm., interval 0.105 mm.; postocular bristles, length 0.105 mm.; prothorax, length 0.218 mm., width (inclusive of coxae) 0.386 mm.; pterothorax, width 0.357 mm.; abdomen, width 0.480 mm.; tube, length 0.188 mm., width at base 0.087 mm., at apex 0.041 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	49	60	62	56	55	55	45	57
Width (μ)	48	35	40	39	39	36	30	20

Total length of antenna 0.44 mm.

Male (brachypterous).—Only slightly smaller than female and similar in structure; fore femora hardly more swollen than in female, tarsal tooth scarcely stronger.

Nymphs.—Orange yellow.

Described from 12 females, 29 males and several nymphs of various instars, taken under the bark of a willow branch, at Potter, New York, April 26, 1924, by the writer.

The lanceolate eighth antennal segment and the pale coloration place this species as a true *Trichothrips,* close indeed to the type species *pedicularius* and to the North American species *americanus, angusticeps, marginalis,* etc. Fom these, and from all others of the genus known to me, the brachypterous (perhaps apterous) form differs conspicuously in having only one ocellus and in the position of the sense cone on the seventh antennal segment. In *fumiceps* this sense cone is situated on the *side* of the segment, at the outer angle, instead of on the dorsum near the apex. In *marginalis,* its closest relative, the sense cone is intermediate in position, though more dorsal than lateral. Casually observed, *fumiceps* is more suggestive, perhaps, of *semicaecus,* but the character of the eighth antennal segment is utterly different. In life the dark colored head was visible to the naked eye, and marked the species at once as an addition to the North American fauna.

Rhynchothrips russelli sp. nov.

Female, forma brachyptera.—Length about 1.5 mm. Color dark brown (black to the naked eye), with trochanters, tarsi, and apices of all femora and tibiae yellow, sometimes darkened slightly with brownish; antennae yellow, usually more or less darkened with brown at sides of segments 1 and 2 and in segments 4–8, the pedicels of 4 and 5 invariably brownish, 3 frequently with an obscure brown band at basal two-fifths.

Head 1.1 times as wide as long, boadest somewhat behind eyes; cheeks rounded, distinctly converging posteriorly; lateral and dorsal surfaces striate with widely spaced anastomosing lines, almost subreticulate, and with the usual minute, transparent bristles; vertex roughened, broadly rounded in front, slightly overhanging insertion of antennae and bearing the anterior ocellus at its extremity; postocular bristles about as long as eyes, blunt but not knobbed, dark in color. Eyes about one-third as long as head, subcircular as seen from above, distinctly wider than their interval, ventral extent much less than dorsal. Ocelli situated well forward. Antennae about two and one-fourth times as long as head; segment 3 clavate, symmetrical; 4–6 pedicellate, 4 shorter than 5 and about 1.6 times as long as wide; 7 subpedicellate; 8 rather broadly united to 7. Mouth cone only moderately long, about attaining mesosternum.

Prothorax along median dorsal line about 0.9 as long as head and (inclusive of coxae) from two to two and one-fourth times as wide as long, without a median dark line; all bristles present, rather dully pointed, dark in color, the two pairs at posterior angles longer than postoculars, midlaterals half as long and about equal to the two pairs on anterior margin. Pterothorax slightly wider than prothorax, sides straight, somewhat diverging posteriorly. Wings nearly attaining base of abdomen, brown in color, and with the three usual subbasal bristles short, about equal to those on anterior margin of pronotum, stout, pointed and brown. Legs short, moderately slender; fore tarsi unarmed.

Abdomen large, broad, about 1.4 times as wide as prothorax. Tube about 0.9 as long as head, less than twice as long as basal width and fully twice as wide at base as at apex, sides straight. Bristles dully pointed, brown; lateral bristles on segment 9 only a little more than half as long as tube, shorter than terminal bristles.

Measurements of holotype (♀): Length 1.52 mm.; head, length 0.180 mm., width behind eyes 0.198 mm., at base

0.174 mm.; prothorax, length 0.155 mm., width (inclusive of coxae) 0.348 mm.; pterothorax, width 0.360 mm.; abdomen, width 0.494 mm.; tube, length 0.158 mm.; width at base 0.082 mm., at apex 0.038 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	39	57	62	56	57	59	53	32
Width (μ)	33	34	30	35	32	32	27	15

Total length of antenna, 0.42 mm.

Female, forma macroptera.—Similar, but with eyes and pterothorax larger, antennae somewhat darker, and pedicel of segment 7 of antennae more constricted. Wings of fore pair broad, dark brown to just beyond the third subbasal bristle, remainder very lightly and uniformly clouded with brownish; posterior margin with 9 or 10 accessory hairs; hind wings with faint median vein extending to middle.

Male (brachypterous).—Smaller than female, and with more slender abdomen; fore tarsi unarmed.

Described from 15 females, of which one is macropterous, and one male, collected as follows:

Keene Valley, New York, June 24, 1911, 1 ♀, on Virginia creeper, Mrs. W. S. Stewart (ex collection H. M. Russell).

Beltsville, Maryland, May 2, June 9 and July 4, 1915, 12 ♀♀, on Virginia creeper and in miscellaneous collecting, W. L. McAtee.

Great Falls, Maryland, May 23, 1915, 2 ♀♀, 1 ♂, on Virginia creeper, J. D. H.

Type locality: Beltsville, Maryland.

My attention was first called to this species a number of years ago by the late Mr. H. M. Russell, and it is therefore appropriate that it be known by his name. It appears to be a very distinct little species, readily known from all described forms of the genus by the short pronotum.

DESCRIPTIONS OF THIRTY NEW SPECIES AND TWO NEW GENERA OF NORTH AMERICAN MIRIDAE

(Hemiptera).[1]

By Harry H. Knight, Ames, Iowa.

Plagiognathus flavescens n. sp.

General color pale to yellowish with a tinge of fulvous on the dorsum, distinctly fulvous on mesoscutum and sometimes on pronotum; suggestive of *blatchleyi* Reut. but larger, more elongate, and differs in the yellowish to fulvous color.

♂. Length 6 mm., width 1.7 mm. *Head:* width .9 mm., vetex .31 mm. Rostrum, length 1.94 mm., extending to posterior margins of middle coxae. *Antennae:* segment I, length .43 mm.; II, 1.9 mm.; III, 1.34 mm.; IV, .48 mm.; black, narrowly pale at joints, clothed with pale to dusky pubescence. *Pronotum:* length .71 mm., width at base 1.40 mm.; yellowish to fulvous, clothed with pale to golden simple pubescence, lateral margins and extending along edge of embolium, beset with blackish hairs, also a single black bristle set at each anterior angle of pronotal disk. Sternum blackish, sides paler. *Hemelytra:* elongate, embolar margins nearly parallel, tip of venter scarcely surpassing base of cuneus; pale to yellowish, slightly translucent, disk of corium with longitudinal fuscous cloud, sometimes indistinct; commissure slenderly fuscous; membrane pale fuscous, somewhat paler on central area, anal area distinctly blackish, veins yellowish. *Legs:* pale, femora with two rows of fuscous spots on anterior and on posterior aspects, spots more closely grouped apically; tibial spines and spots at base blackish, knees black, tarsi fuscous, more blackish apically. Venter pale to yellowish, ventrally on genital segment fuscous to black.

♀. Length 5.7 mm., width 2 mm.; very similar to the male in form and color.

Holotype: ♂ July 27, 1917, Mt. Lemon, Santa Catalina Mts., alt. 8,500 ft., Arizona (H. H. Knight); authors' collection. *Allotype:* taken with the type; Cornell University collection. *Paratypes:* a good series taken with the types. 8 ♂ ♀, August 18–22, 1924, Pingree Park, Colorado (Drake and Hottis).

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

In my key to the species of *Plagiognathus* in the "Hemiptera of Connecticut," *flavescens* runs to either *rosicola* or *blatchleyi*; but distinguished from *rosicola* by the much paler color, and from *blatchleyi* by the larger, more elongate form, and narrower vertex; width of vertex in the male is not equal to length of antennal segment I, or about equal in the female.

Atractotomus acaciae n. sp.

Distinguished from *albidicoxis* and *hesperius* by the shorter antennal segment II which does not equal width of head, also by the pale rostrum.

♂. Length 2.3 mm., width 1.14 mm. *Head:* width .66 mm., vertex .31 mm. Rostrum, length .84 mm., attaining middle of hind coxae, pale, last two segments black. *Antennae:* segment I, length .14 mm., thickness .085 mm.; II, .56 mm., thickness .128 mm., fusiform, clothed with prominent black pubescence; III, .199 mm., slender; IV, .185 mm.; black, last two segments pale. *Pronotum:* length .48 mm., width .98 mm. Black, tip of scutellum, basal angles of corium, and sometimes extending along claval suture, pale; thickly clothed above and below with white, closely appressed, scale-like pubescence, intermixed with fine dusky hairs, with two or three prominent black hairs at anterior angles of pronotum.

♀. Length 2.6 mm., width 1.3 mm. *Head:* width .67 mm., vertex .33 mm. *Antennae:* segment I, length .14 mm.; II, .51 mm., thickness .13 mm.; III, .199 mm.; IV, .185 mm. Very similar to the male in form and coloration; pale areas frequently more extensive, femora more or less pale and showing spots of blackish, tibiae paler with black spots at base of spines.

Holotype: ♂ June 7, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Allotype:* same data as the type. *Paratypes:* 8 ♂ ♀, taken with the types. 2 ♀ June 18, 1915, Lewis Spings, ♀ June 18, Fort Huachuca, Arizona (Harold Morrison).

Psallus suaedae n. sp.

Distinguished from other described species of *Psallus* by the fusco-reddish femora and dotted tibiae, combined with the pale greenish dorsum and venter.

♂. Length 2.6 mm., width 1 mm. *Head:* width .71 mm., vertex .34 mm. Rostrum, length .77 mm., reaching upon middle of hind coxae. *Antennae:* segment I, length .17 mm.; II, .77 mm.; III, .51 mm.; IV, .34 mm.; with fine pale to dusky pubescence, greenish yellow, basal segment fusco-reddish. *Pronotum:* length .40 mm., width at base .86 mm. Dorsum and venter pale greenish, changing to pale and yellowish; genae, propleura, coxae, femora, and dots on tibiae, fusco-reddish with a suggestion of a purplish hue; reddish marks and dots sometimes appearing at each side of vertex, on frons, tylus, and anterior angles of pronotum; tibiae and spines pale, about four prominent spots on basal half which practically form annuli; femora paler apically and with the reddish color forming dots. Dorsum clothed with pale, sericeous, deciduous pubescence, and intermixed with fine, pale and fuscous simple pubescence. Membrane pale, obscurely marked with pale fuscuous spots, veins yellowish.

♀. Length 1.06 mm., width 1.2 mm.; slightly more robust than the male but otherwise very similar.

Holotype: ♂ July 21, 1917, Santa Cruz River, Tucson, Arizona (H. H. Knight); author's collection. *Allotype:* taken with the type; Cornell University collection. *Paratypes:* a good series taken with the types and found breeding on *Suaeda suffrutescens*; 3 ♂, 1 ♀, July 12, 1917, Mesilla Park, New Mexico (H. H. Knight); 6 ♂ ♀ July 28, 1900, Grand Junction, Colorado (E. D. Ball); 3 ♂ July 23, 1914, El Paso, Texas (J. C. Bradley).

Macrotylus geminus n. sp.

Suggestive of *amoenus* Reuter but slightly smaller in size and differs in color of legs and white areas on cuneus.

♂. Length 2 mm., width .8 mm.; color apple green, antennae, legs, and wing membrane black, femora with longitudinal white mark on apical half of anterior and posterior aspects, also a slender white line on ventral margins; cuneus white, a nearly transverse black mark across middle, the white areas never greenish yellow as in *amoenus*; the white spot each side of membrane also larger.

♀. Slightly more robust than the male but very similar in form and color.

Holotype: ♂ August 19, 1924, Sierrita Mts., alt. 4,000 ft., Arizona (A. A. Nichol); author's collection. *Allotype:* taken with type. *Paratypes:* 2 ♂, taken with types. Mr. Nichol collected this species on *Acacia* sp.

Coquillettia nicholi n. sp.

Color of hemelytra suggestive of *insignis* Uhler, but shape of head more nearly that of *Orectoderus obliquus* Uhler, while the shape of pronotum differs from both; arolia as in *Coquillettia insignis* Uhler.

♂. Length 5.7 mm. *Head:* width .94 mm., vertex .51 mm., postocular space (.21 mm.) equal to three-fourths the width of an eye; greatest length of eye .48 mm., width .28 mm.; as viewed from the side, greatest thickness of head (.63 mm.) along a line drawn through base of antennae and middle of gula. *Antennae:* segment I, length .34 mm.; II, 2 mm.; III, missing. *Pronotum:* length .88 mm., width at base 1.01 mm.; width of collar .54 mm., width across middle of disk .80 mm.; calli greatly swollen, confluent, occupying a space equal to half the length of pronotal disk, distinctly sulcate behind; lateral margins of disk not defined, coxal cleft visible from above; disk subopaque, very finely transversely rugulose in the sulcation behind calli. *Hemelytra:* dark brownish black, scarcely darker at apex of corium, corium pale white on basal half between radial vein and clavus, but not reaching apex of clavus; cuneus yellowish white on basal half, areole pale on basal two-thirds; membrane slightly abbreviated, extending beyond cuneus by a distance equal to half its length.

Head, thorax, legs and abdomen, brownish black, ostiolar peritreme and posterior one-fourth of third abdominal segment white; tibiae, front femora, and first two antennal segments brownish.

Holotype: ♂ July 20–25, 1920, Yellowstone, National Park, Wyoming (A. A. Nichol); author's collection.

Coquillettia albiclava n. sp.

Distinguished by the white clavus, pale translucent basal half of corium, and dark embolium; antennal segments II and III equal in length.

♂. Length 6 mm. *Head:* width .83 mm., vertex .37 mm.; eyes distinctly smaller, less protruding and more oblique than in *insignis* Uhler; greatest length of eye .47 mm., width .257 mm. *Antenna:* segment I, length .28 mm., fulvous; II, 1.74 mm., brownish black; III, 1.74 mm., blackish; IV, missing. Head, calli, sides of pronotum, scutellum, mesoscutum, and front femora, fulvous, pronotal disk except calli, blackish. *Hemelytra:* opaque white, fusco-brownish at base and apex; corium bordering clavus clear translucent, exterior to radial vein and apically, dark olive brown, apex darker; embolium dark brown, darker apically; cuneous brownish black, basal one-third white; membrane dark fusco-brownish, basal two-fifths or areole and membrane opposite pale. Legs except front femora dark brown; venter brownish black, shining, posterior margin of third segment slightly pale.

Holotype: ♂ April 17, 1915, Sabino Canyon, Tucson, Arizona (J. F. Tucker); author's collection. *Paratype:* ♂ April 29, 1919, type locality (W. D. Edmonston).

Eustictus minimus n. sp.

Distinguished from all other described members of the genus by its small size and uniformly brown antennae.

♂. Length 3.5 mm., width 1.2 mm. *Head:* width .81 mm., narrowest part of vertex at antero-dorsal margin of eyes, width .14 mm. Rostrum, length 1.28 mm., reaching to posterior margins of middle coxae. *Antennae:* segment I, length .27 mm.; II, .83 mm.; III, .48 mm.; IV, .43 mm.; uniformly pale brownish, clothed with fine pale pubescence. *Pronotum:* length .73 mm., width at base 1.14 mm.; lateral margins of disk ecarinate. Head and thorax dark brownish to black, somewhat shining, juga, sides of tylus, and slender basal margin of pronotal disk, pale. Scutellum and clavus with long erect hairs. *Hemelytra:* pale, base and apex of clavus, narrow base and more broadly on apex of corium, fusco-brownish, apex of embolium reddish to blackish, apex of cuneus fuscous. Membrane pale fumate, anal area and veins fuscous. Legs pale, apical half of femora dark fusco-brownish, tibiae paler except bases; length of tibial spines not equal to thickness of tibia. Venter dark reddish brown to blackish, shining, clothed beneath and on genital segment with long pale hairs.

♂. Length 2.4 mm., width 1.4 mm. *Head:* width .81 mm., vertex .23 mm. *Antennae:* segment I, length .28 mm.; II, .83 mm.; III, .48 mm.; IV, .43 mm. Very similar to male but eyes smaller and vertex correspondingly wider.

Holotype: ♂ July 31, 1906, Brownsville, Texas (A. B. Wolcott); author's collection. *Allotype:* ♂ May 18, 1904, Brownsville, Texas; Cornell University collection. *Paratypes:* ♂ May 1, 1904, ♀ June 6, 1908, ♀ Dec. 16, 1910, Brownsville, Texas. ♀, Edingburg, Texas. Found "under bark" and on mesquite.

Eustictus obscurus n. sp.

Closely allied to *catulus* Uhler, but eyes less prominent and vertex correspondingly wider; very similar in color but pronotum and scutellum brownish black, lateral carinae and slender basal margin white, femora and tibiae uniformly dark fusco-brownish without paler maculae as in *catulus.* Female with dorsal width of an eye not quite equal to width of vertex, while in the female of *catulus* the vertex is not equal to dorsal width of an eye.

♂. Length 5.3 mm., width 1.9 mm. *Head:* width 1.17 mm., vertex .17 mm. Rostrum, length 2.03 mm., attaining hind margins of middle coxae. *Antennae:* segment I, length .58 mm., thickness .14 mm.; II, 1.67 mm., thickness .128 mm., cylindrical; III, .87 mm.; IV, .77 mm. *Pronotum:* length 1.01 mm., width at base 1.74 mm.

♀. Length 5.8 mm., width 2.2 mm. *Head:* width 1.97 mm., vertex .37 mm. *Antennae:* segment I, length .67 mm.; II, 1.91 mm., more sparsely clothed with pubescence than in catulus; III, .94 mm.; IV, .86 mm. *Pronotum:* length 1.06 mm., width at base 1.94 mm. Coloration very similar to the male.

Holotype: ♂ July 23, Huachuca Mts., Arizona; author's collection. *Allotype:* topotypic. *Paratypes:* 2 ♀ topotypic; ♂ July 13, 1917, Lordsburg, New Mexico; ♂ July 20, Texas Pass, ♂ July 24, 1917, Oracle, Arizona (H. H. Knight).

Eustictus productus n. sp.

Larger and more elongate than *catulus* Uhler; length of antennal segment II exceeds width of pronotum at base, width of vertex slightly greater than thickness of antennal segment I.

♂. Length 6.3 mm., width 2.3 mm. *Head:* width 1.28 mm., vertex .157 mm. Rostrum, length 2.5 mm., barely attaining posterior margins of hind coxae. *Antennae:* segment I, length .70 mm., thickness (.128 mm.) not equal to width of vertex; II, 2 mm., thickness .128 mm.; III, .94 mm.; IV, missing; color and pubescence very similar to *catulus* but segment I slightly more slender and darker in color. *Pronotum:* length 1.09 mm., width at base 1.91 mm. Dorsum more uniformly brownish black than in *catulus,* pale areas nearly obsolete. Membrane pale fusco-brownish, veins darker, a dark mark lying next to larger areole and paralleling apical half of cubitus. Femora and tibiae reddish brown, paler beneath, more uniformly darker than in *catulus.*

Holotype: ♂ June 18, 1915. Huachuca Canyon, Fort Huachuca, Arizona (Harold Morrison); author's collection.

Eustictus morrisoni n. sp.

Coloration suggestive of *catulus* Uhler, but size much larger and differs in structure of antennae; width of vertex slightly greater than dorsal width of an eye, while in the female of *catulus* the vertex is distinctly less (vertex .33 mm., eye .40 mm.).

♀. Length 6.5 mm., width 2.9 mm. *Head:* width 1.27 mm., vertex .43 mm. Rostrum, length 3 mm., scarcely attaining posterior margins of hind coxae. *Antennae:* segment I, length .83 mm., thickness .17 mm.; II, 2.11 mm., thickness at middle .086 mm., slightly thicker apically, more sparsely clothed with pubescence than *catulus* and intermixed with longer more erect pubescent hairs; III, .94 mm.; IV, .81 mm. *Pronotum:* length 1.34 mm., width at base 2.5 mm. Dorsum and legs colored much as in *catulus,* but membrane uniformly fusco-brownish, veins darker.

Holotype: ♀ June 18, 1915, Lewis Springs, Arizona (Harold Morrison); author's collection.

Eustictus hirsutipes n. sp.

Larger than *catulus* Uhler, hemelytra more translucent; distinguished by the long, erect hairs on hind tibiae and apical half of femora, length of hairs exceeding three times the diameter of tibia.

♂. Length 5.7 mm., width 2.1 mm. *Head*: width 1.2 mm., vertex .20 mm. Rostrum, length 2.63 mm., slightly surpassing posterior margins of hind coxae. *Antennae*: segment I, length .77 mm., thickness .14 mm., fusco-brownish, without distinct transverse markings; II, 2 mm.; III, 1.2 mm.; color of last three segments much as in *catulus. Pronotum*: length 1.14 mm., width at base 2 mm.; disk black, shining, slender basal margin pale. *Scutellum* blackish. *Hemelytra:* glabrous, shining, yellowish, translucent, without opaque blackish areas and spots such as in *catulus;* basal half of clavus and apical one-third of corium fusco-translucent, apex of embolium with red (hypodermal); cuneus yellowish to reddish, semiopaque, apical one-third fuscous; membrane uniformly fusco-brownish, veins slightly darker. Legs uniformly yellowish brown, tibiae slightly darker, hind femora and tibiae with long erect hairs as described above. Venter reddish to blackish, genital segment darker, sparsely clothed beneath with long erect hairs.

♂. Length 6.3 mm., width 2.2 mm.; larger and more robust than the male but very similar in coloration. *Head*: width 1.17 mm., vertex .44 mm. *Antennae:* segment I, length .86 mm., II, 2.3 mm., III, 1.28 mm.; IV, 1.08 mm. *Pronotum*: length 1.17 mm., width at base 2.06 mm.

Holotype: ♂, July 20, 1917, Texas Pass, Arizona (H. H. Knight), at trap light; author's collection. *Allotype:* taken with type; Cornell University collection. *Paratypes:* 2 ♀, taken with types; 3 ♂, July 15, 1917, Bowie, Arizona (H. H. Knight).

Eustictus claripennis n. sp.

Nearest to *pusillus* Uhl., but differs in the black pronotum and scutellum, and in the translucent hemelytra.

♂. Length 5.1 mm., width 2 mm. *Head:* width 1.06 mm., vertex .33 mm., pale, front and vertex fuscous. Rostrum, length 2.5 mm., reaching to near posterior margins of hind coxae, yellowish, apex brownish. *Antennae:* segment I, length .74 mm., thickness .17 mm., rather indistinctly transversely marked with fuscous; II, 2 mm., cylindrical (.13 mm. thick), pale with sprinkling of fuscous, clothed with very fine, short, recumbent pubescence, and intermixed with short but more erect fuscous pubescent hairs, base slightly constricted and glabrous; III, 1.10 mm., cylindrical, slightly more slender than II; IV, .88 mm., last two segments colored and clothed with pubescence as on segment II. *Pronotum:* length 1.14 mm., width at base 1.83 mm., disk black, slender basal margin and lateral carinate margins pale; propleura except for fuscous dorsal margin, pale yellowish translucent like the sternum and pleura of meso- and metathorax, ostiolar peritreme whitish. *Scutellum* strongly convex, black, mesoscutum brownish at sides. *Hemelytra:* glabrous, shining, pale translucent, apex of corium narrowly, and tip of cuneus, fuscous, apex of embolium with reddish and black; membrane practically clear, or with only a tinge of fumate, veins pale brownish. *Legs:* pale, hind femora becoming fuscous on apical half; hind tibiae brownish black, front and middle tibiae with a longitudinal reddish brown line on dorsal aspect; hind femora with a few dark spines on posterior aspect which are similar to the tibial spines, length of spines about equal to thickness of tibia. *Venter* pale to reddish, genital segment fuscous.

Holotype: ♂, July 1, 1917, Helotes, Texas (H. H. Knight); author's collection. *Paratypes:* ♂, taken with type; Cornell University collection.

Eustictus claripennis clarus n. var.

♀. Length 5.1 mm., width 2 mm. *Head:* width 1 mm., vertex .43 mm. Rostrum, length 2.51 mm., slightly surpassing posterior margins of hind coxae. *Antennae:* segment I, length .66 mm.; II, 2.14 mm., more slender on basal half and gradually thickened apically; III, .97 mm.; IV, .88 mm.; uniformly yellowish. *Pronotum:* length .97 mm., width at base 1.7 mm., disk much more flattended and lateral carinae more prominent than in the male *claripennis*; carinae and slender basal margin white, submargin narrowly fuscous. Scutellum black, basal angles, extreme apex, and mesoscutum yellowish.

General coloration yellowish translucent, narrow distal margin of corium and embolium, and tip of cuneus, fuscous; tibiae, including hind pair, with longitudinal reddish black line on dorsal aspect, this line paralleled by a yellowish white line each side. Differs from *claripennis* in color of antennae, pronotum, and hind tibiae; also differs in structure of pronotum and slightly longer rostrum. This form may very well represent a distinct species but until the female of *claripennis* is known it seems best to regard *clarus* as a variety.

Holotype: ♀, June 7, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Paratype:* ♀, May 2, San Diego, Texas; Cornell University collection.

This form approaches *pusillus* (Uhler), but differs in coloration of the hemelytra and especially in markings of cuneus. A specimen of *pusillus* is at hand from Nogales, Arizona; also a specimen labeled "Ariz. H. K. Morrison" which probably represents type material of that species.

Lopidella n. gen.

Closely allied to *Lopidea* Uhler, but distinguished by the finely punctate pronotum, vertex strongly declivitous anteriorly and carinate at base, gena with a single suture extending downward from base of jugum to a point on middle of gena; dorsum thickly clothed with semidecumbent pubescence; anterior margin of pronotum not elevated nor sulcate just before and between calli as in *Lopidea*; arolia and left genital clasper essentially the same as in *Lopidea*. *Genotype: Lopidella flavoscuta* new species.

Lopidella flavoscuta n. sp.

Distinguished by the black color, with scutellum and more or less on head, yellow; thickly clothed with semidecumbent pale yellowish pubescence.

♂. Length 5 mm., width 1.7 mm. *Head:* width 1.06 mm., vertex .54 mm. Rostrum, length 1.07 mm., thick, scarcely attaining posterior margins of middle coxae. *Antennae:*

segment I, length .33 mm.; II, 1.21 mm.; III, broken. *Pronotum:* length .86 mm., width at base 1.69 mm.; disk finely punctate. Black, scutellum and head yellow, tylus, apical half of lora, broad mark each side of frons, and small impressed spot each side of vertex, black; basal angles of scutellum frequently black, in paler forms the anterior margin of pronotum and propleura yellow. Thickly clothed with semidecumbent pale yellowish pubescence. Genital claspers distinctive, the left clasper very suggestive of *Lopidea*; right clasper large, extending backward then curving upward, apical half slightly more slender, the apex tapering sharply to an acute point; segment wall above base of right clasper, projecting distad in a process .17 mm. in length, also a sharp point formed at dorsal margin of segment.

♀. Length 4.5 mm., width 1.9 mm.; more robust than the male but very similar in coloration; the margins of pronotum more broadly pale, with femora becoming brownish.

Holotype: ♂, April 12, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Allotype:* April 17, 1916, Sabino Canyon, near Tucson, Arizona (J. F. Tucker); author's collection. *Paratypes:* ♀, taken with type; 2 ♂, Phoenix, Arizona (H. G. Barber).

Brachypterous form. ♀. Length 3.6 mm., width 2 mm. Hemelytra just attaining apex of abdomen, membrane with less area than cuneus; more broadly pale than macropterous form; embolium, narrow basal and lateral margins of pronotum, yellow.

Morphotype: ♀, April 12, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Paramorphotypes:* ♀, April 16, 1916, Sabino Canyon, near Tucson, Arizona (J. F. Tucker). ♀, June 15, Santa Rita Mts., Arizona (A. A. Nichol).

Cyrtorhinus insperatus n. sp.

Size of *caricis* (Fall.) but distinguished by the fulvous legs and scutellum.

♂. Length 3 mm., width .8 mm. *Head:* width .61 mm., vertex .28 mm.; subglobose, shining black, eyes nearly round, strongly protruding, collum slightly elongated thus the eyes appear removed from collar, with two black bristles each side of vertex, and one each side about front margin of eye; a small pale ocellate spot each side of vertex above eye. Rostrum, length 1.08 mm., reddish yellow, basal segment greenish, apical segment black, reaching to base of middle femora. *Antennae:* segment I, length .34 mm., slightly thicker (.085 mm.) on basal one-third; II, 1.52 mm., becoming slightly thicker on apical half (.058 mm. thick); III, 1.01 mm.; IV, .57 mm., black, finely pale to dusky pubescent. *Prothorax:* length .37 mm., width at base .73 mm., brownish black, becoming fulvous basally, anterior margin pale. Scutellum and mesoscutum fulvous, the mesoscutum broadly exposed and tinged with fuscous. Sternum fulvous, sides, pleura, and ostiolar peritreme becoming fuscous. Dorsum clothed with very fine yellowish to dusky pubescence. *Hemelytra:* embolar margins nearly straight, cuneus not deflexed; semitranslucent, fumate, basal area of corium and narrow margin of clavus pale translucent, clavus fuscous, except along claval suture, the scutellar margin and slenderly along commissure fulvous; membrane and veins uniformly fumate, anal area darker. *Legs:* pale fulvous, tibiae and tarsi black, femora with fuscous line along dorsal margin, also a reddish to fuscous longitudinal line on anterior face, this line being more subventral on front femora. *Venter:* greenish with a metallic luster, genital segment black.

Female: Length 3.5 mm., width 1.14 mm.; more robust than the male but very similar in coloration, second antennal segment more slender. Venter greenish yellow, second genital segment and full length of vagina exterior, fuscous to blackish.

Holotype: ♂, June 7, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Allotype:* same data as type. *Paratypes:* ♂ ♀, taken with types.

Orthotylus spinosus n. sp.

Form of head and body, and coloration nearly identical with *viridis* Van D., but about the size of *flavosparsus* Sahlb.

♂. Length 3.4 mm., width 1.11 mm. *Head:* width .68 mm., vertex .28 mm., rostrum, length 1.06 mm., attaining posterior margins of hind coxae. *Antennae:* segment I, length .25 mm.; II, 1.06 mm., cylindrical, slender; III, .54 mm.; IV, .28 mm. *Pronotum:* length .43 mm., width at base .94 mm. Dorsum clothed with yellowish to dusky simple pubescence, and intermixed on hemelytra with more recumbent, sericeous, dusky pubescence. Membrane uniformly pale fuscous, slightly paler within areoles, veins pale. Genital claspers distinctive, left clasper terminating dorsally in an acuminate, slightly decurved hook; right clasper appearing flat in lateral aspect, broadly rounded at apex, and curving slightly downward.

♀. Length 3.1 mm., width 1.06 mm.; very similar to the male in form and color.

Holotype: ♂, July 18, 1917, Gowdy Creek Canyon, Bonita, Arizona (H. H. Knight); author's collection. *Allotype:* taken with type; Cornell University Collection. *Paratypes:* 22 ♂, taken with the types. 2 ♂, July 15, 1924, Santa Catalina Mts., alt. 4,500 ft. (A. A. Nichol). My notes show this species was collected on *Juniper pachyphloea* and *Juniper monosperma.*

Pamillia nyctalis n. sp.

Color a uniform dark fuscous brown, with cuneal fracture, and base of corium and embolium, pale; clothed with very fine short pubescence, thus differs from both *behrensii* and *davisi.*

♂. Length 2.8 mm., width 1.2 mm. *Head:* width .71 mm., vertex .33 mm.; brown, lower half reddish brown. Rostrum, length 1.16 mm., reaching to middle of hind coxae. *Antennae:* segment I, length .27 mm., thickness .114 mm.; II, .93 mm., gradually thickened from base to apex (.086 mm. thick); III, .63 mm., thickness .10 mm.; IV, .54 mm.; thickly clothed with short, fine yellowish pubescence, dark brown, segment I, yellowish brown. *Pronotum:* length .59 mm., width at base .97 mm.; form nearly as in *behrensii,* but disk slightly more flattened posteriorly and posterior margin coming higher on mesonotum. Dorsum clothed with very fine, short, soft, pale to yellowish pubescence, a few long pubescent hairs at inner angles of clavus; surface opaque, or slightly shining on pronotum and scutellum. *Hemelytra:* embolar margins parallel on basal half, moderately flaring on apical one-third; fusco-brownish, clavus more distinctly brownish next to scutellum, basal two-fifths of corium and embolium pale, a very light transverse frosted band apparent on clavus just behind tip of scutellum; apical area of corium also exhibiting a very light frosted appearance, extreme apex pale at cuneal fracture. Membrane uniformly fusco-brownish. Venter reddish brown to dark brown, clothed beneath and on genital segment with prominent pale yellowish pubescent hairs.

♀. Length 3.2 mm., very similar to the male in form and coloration.

Holotype: ♂, July 16, 1917, Post Creek Canyon, Bonita, Arizona (H. H. Knight); collected at light; author's collection. *Allotype:* taken with type; Cornell University collection.

Pamillia pilosella n. sp.

Having the aspect of *nyctalis,* but distinguished at once from that species by the prominent erect hairs on the dorsum.

♂. Length 3.2 mm., width 1.4 mm. *Head:* width .81 mm., vertex .43 mm. *Antennae:* segment I, length .31 mm.; II, 1.18 mm.; III, .76 mm.; IV, .63 mm. *Pronotum:* Length .68 mm., width at base 1.11 mm. Brown color of antennae, head, and body, similar to that of *nyctalis,* but the white and pruinose areas of hemelytra are larger and more conspicuous. Scutellum and *hemelytra* clothed with very fine short pubescence and intermixed with long erect hairs which are more numerous and prominent than in either *behrensii or affinis.* Pronotum with lateral margins sulcate but less deeply than in *behrensii,* contour of disk more as in *nyctalis,* posterior margin leaving mesoscutum broadly exposed. Embolar margins subparallel on basal half, moderately arcuate on apical half. Basal half of clavus of the same dark brown color as the apical half, separated by a wedge-shaped strongly pruinose area, projecting from pale basal part of corium; apex of corium and base of cuneus pale with pruinose luster. Membrane fully developed, uniformly dark brownish. Venter dark brown, clothed with prominent long pale pubescent hairs; left genital clasper subtriangular at base, tapering to a slender apex which is slightly curved around apex of genital segment.

Holotype: ♂, August 6, 1907, Chiricahua Mts., Arizona (J. L. Webb); Cornell University collection.

Pamillia affinis n. sp.

Color suggestive of *behrensii* Uhler, but head and thorax lighter brown, clavus brown on basal half (fulvous in *behrensii*). Differs from *behrensii* in form of pronotum, lateral margins not so deeply concave, disk more flattened, broadly convex, the posterior margin completely covering the mesoscutum; pubescence nearly as in *behrensii,* but the long erect, fine hairs present on pronotum and vertex of that species are much less conspicuous in *affinis.* Membrane abbreviated, scarcely attaining apex of venter.

♀. Length 2.2 mm., width 1.5 mm. *Head:* width .86 mm., vertex .44 mm. *Antennae:* segment I, length .31 mm.; II, 1.17 mm.; III, .74 mm.; IV, .67 mm. *Pronotum:* length .66 mm., width at base 1.08 mm.

Holotype: ♀, August, Fort Wingate, New Mexico; author's collection.

Ceratocapsus apicalis n. sp.

Allied to *drakei* Knight, but size smaller, distinguished by finer simple pubescence and having more of the silvery sericeous scale-like pubescence; also by the black pronotum and scutellum, distinctly blackish apical half of membrane, and fuscous cloud at inner apical angles of corium. Hemelytra including cuneus, yellowish red, sparsely clothed with golden pubescent hairs, longest on clavus and inner angles of corium; scutellum, clavus and corium rather thickly clothed with white sericeous scale-like pubescence; fuscous cloud on inner apical angles of corium, invading anal area of membrane. Membrane white, apical half and extending slightly between areoles, uniformly dark fuscous. Head, thorax, and venter, dark brownish black, genae and lora reddish.

♂. Length 3.7 mm., width 1.26 mm. *Head:* width .68 mm., vertex .30 mm. Rostrum, length 1.17 mm., reaching to middle of hind coxae. *Antennae:* segment I, length .30 mm.; II, 1.06 mm.; III, .71 mm.; IV, .50 mm.; pale yellowish to dusky, apical segment dusky. *Pronotum:* length .58 mm., width at base 1.10 mm.

♀. Length 2.4 mm., width 1.2 mm.; brachypterous, cuneus present but membrane area not equal to more than half of cuneus, white, last abdominal segment exposed. *Head:* width .67 mm., vertex .31 mm. *Antennae:* segment I, length .24 mm.; II, .91 mm.; III, .60 mm.; IV, .37 mm. *Pronotum:* length .47 mm., width at base .88 mm. Vestiture similar to the male, color a rich brownish yellow, scutellum black, fuscous cloud at apex of corium replaced by dark brown, apical half of corium more distinctly polished and shining.

Holotype: ♂, July 2, Fabens, Texas (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratypes:* 16 ♂ ♀, taken with the types. COLORADO: ♂ ♀, June 18, 1902, Fort Collins (E. D. Ball). NEW MEXICO: ♂, July 12, 1917, Deming (H. H. Knight), at trap light. ♂, May 18, Faywood (W. J. Gerhard). TEXAS: ♀, July 23, 1914, El Paso (J. C. Bradley). ♂, August 23, 1920, Eastland County (Grace O. Wiley).

Ceratocapsus denticulatus n. sp.

Allied to *apicatus* Van D., but differs in the more slender antennae and pale basal half of the hemelytra, also not so strongly shining.

♂. Length 3.6 mm., width 1.36 mm. *Head:* width .77 mm., vertex .19 mm. Rostrum, length 1.14 mm., reaching to middle of intermediate coxae. *Antennae:* segment I, length .23 mm.; II, .91 mm., cylindrical, equal in thickness to segment I; III, .57 mm.; IV, .47 mm.; pale yellowish, segment IV and apical half of III brown. *Pronotum:* length .60 mm., width at base 1.20 mm.; disk very minutely punctate, Dorsum clothed with very fine closely appressed sericeous, yellowish pubescence, intermixed with sparsely set, longer golden yellow pubescence, longest hairs on scutellum and clavus. Color castaneous brown, scutellum paler; hemelytra pale yellowish, apical half of corium and embolium, and the cuneus, fusco-brownish, red showing in disk of cuneus. Membrane pale yellowish, apical half and the anal area fuscous. Genital claspers very small, left clasper curving straight back to an acuminate point, right clasper very small, twice as long as broad, notched at apex, lower point longer.

♀. Length 3.6 mm., width 1.4 mm. *Head:* width .80 mm., vertex .34 mm. *Antennae:* segment I, length .28 mm.; II, 1.03 mm.; III, .66 mm.; IV, .54 mm. *Pronotum:* length .61 mm., width at base 1.23 mm. Very similar to the male in form, vestiture, and color.

Holotypes: ♂, July 27, 1917, Mt. Lemon, Santa Catalina Mts., Arizona, alt. 9,000 ft. (H. H. Knight); author's collection. *Allotypes* ♀, Aug. 3, 1915, Huachuca Mts., Arizona (H. G. Barber). *Paratypes:* ♂, taken with the type; Cornell University collection.

Ceratocapsus clavicornis n. sp.

Allied to *fusiformis* Van D., but distinguished by the differently formed genital claspers, and in color and type of pubescence; distinguished by the broad flattened blade on terminal portion of left genital clasper.

♂. Length 3.3 mm., width 1.3 mm. Rostrum, length 1.2 mm., reaching to middle of hind coxae. *Head:* width .74 mm., vertex .33 mm. *Antennae:* segment I, length .23 mm., thickness .086 mm.; II, .74 mm., slender at base and gradually thickened to apex (.09 mm. thick); III, .39 mm., thickness .10 mm., base more slender; IV, .41 mm., thickness .11 mm., dark brown, segment I and base of II yellowish brown, clothed with fine pale pubescence. *Pronotum:* length .71 mm., width at base 1.21 mm. Dorsal surface finely punctate as in *pumillus,* clothed with sparsely set long, erect, golden brown hairs and intermixed with short, sericeous, white scale-like pubescence on scutellum, clavus, and basal half of corium; apical area of corium and frequently basal area of pronotal disk darker brown; cuneus and apically on embolium showing hypodermal red through the brown. Membrane uniformly dark brown. Genitalia distinctive; right clasper very near that of *fusiformis* but ventral arm with bifurcated arms broad at apex, one ending in two short prongs; left clasper distinctive, with rather broad upright prong at base while the ventral and terminal portion is abruptly enlarged into a broad flat blade.

♀. Length 3.2 mm., width 1.4 mm. *Head:* width .74 mm., vertex .37 mm. *Antennae:* segment I, length .20 mm., thickness, .086 mm.; II, .77 mm., greatest thickness .09 mm.; III, .40 mm., thickness 1.05 mm.; IV, .41 mm., width .11 mm. Very similar to the male in form and color although vertex slightly broader.

Holotype: ♂, August 3, 1917, Grand View, Grand Canyon, Arizona (H. H. Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 30 ♂ ♀, taken with the types on *Cowania mexicana.* ♂, August 4, 1917, Williams, Arizona (H. H. Knight).

Neoborella n. gen.

Closely related to *Neoborus* Dist., but differs in the strongly convex scutellum, distinctly tumid and transversely striated front of head, longer and more slender rostrum, more steeply declivitous pronotal disk with rounded lateral margins, more closely and strongly punctate scutellum and pronotal disk, and extremely short third and fourth antennal segments; antennal segment III barely exceeding width of vertex in male and distinctly shorter in female, segment IV only equal to one-half the length of segment III. Arolia erect and diverging at apices as in *Neoborus* Dist., and form of male genitalia very similar.

Genotype: Neoborella tumida new species.

Neoborella tumida n. sp.

♂. Length 4 mm., width 1.8 mm. *Head:* width 1 mm., vertex .33 mm.; eyes large, vertical, extending well below insertion of antennae; juga and lora much less prominent and frons distinctly more tumid than in *Neoborus;* front obliquely, transversely striate, surface of vertex and frons rather distinctly alutaceous, a glabrous alutaceous dark spot each side of vertex next the eye, clothed with short pale to golden sericeous pubescence; basal carina formed mainly by the vertical offset from vertex to collum. *Rostrum:* length 1.46 mm., reaching to posterior margins of middle coxae, distinctly more slender than in *Neoborus,* yellowish to reddish, blackish at apex. *Antennae:* segment I, length .30 mm.; II, 1.57 mm., cylindrical, nearly equal to thickness of segment I, slightly constricted at base; III, .37 mm.; IV, .22 mm.; yellowish brown, last two segments fuscous, clothed with rather short, fine yellowish pubescence. *Pronotum:* length .77 mm., width at base 1.66 mm.; disk distinctly more arched posteriorly than in *Neoborus,* rather closely, deeply and evenly punctate, punctures extending between and before calli, disk sloping to lateral margins which are rounded and ecarinate, basal margin formed by a smooth broadly arcuate line, the smooth edge set off by the punctures which form a submarginal line; calli narrow, convex, smooth, narrowing as they slope downward to anterior angle at a point behind middle of eye; collar distinct, slender, in contact with eyes, not raised to level of base of vertex disk clothed with rather short pale to golden sericeous pubescence. *Scutellum* very strongly convex, sloping off steeply to sides and apex, punctate as the pronotal disk, but punctures more shallow along median line and apically, punctures at sides exhibiting a transversely confluent tendency; mesoscutum somewhat more exposed than in *Neoborus,* sloping down to base of scutellum, clothed with more prominent golden pubescence than scutellum. *Sternum* dark reddish brown to blackish, pleura reddish, ostiolar peritreme pale. *Hemelytra:* embolar margins moderately arcuate; distinctly punctate, but more shallowly than on pronotum and scutellum, surface subopaque, clothed with pale, golden, and fuscous pubescence, the latter more prominent on apical half and on dark areas; cuneus rather strongly deflexed; reddish brown, embolium and cuneus red (hypodermal), transversely across corium and extending along claval suture, and more or less on apical half of clavus, fuscous to blackish. *Membrane* fuscous, slightly darker within and without the apices of larger areoles, veins reddish. *Legs* yellowish to brownish, hind femora reddish brown apically; tibiae pubescent, spines scarcely apparent. *Venter* yellowish brown to reddish, yellowish pubescent; form of genital claspers very near that of *Neoborus.*

♀. Length 3.7 mm., width 2 mm.; more robust than the male but very similar in color. *Head:* width .98 mm., vertex .43 mm. *Antennae:* segment I, length .27 mm., slender at base and gradually thickened apically, yellowish, apex infuscated; III, .34 mm.; IV, .19 mm. Embolar margins strongly arcuate on posterior two-thirds.

Holotype: ♂, July 27, 1917, Mt. Lemon, alt. 9,000 ft., Arizona (H. H. Knight); author's collection. *Allotype:* taken with type; Cornell University collection. *Paratypes:* a good series taken with types. ♀, July 29, 1905, Huachuca Mts., Arizona (H. G. Barber). 10 ♂ ♀, Aug. 18–22, 1924, Pingree Park, Colorado (Drake & Hottes).

Lygus (Neolygus) deraeocorides n. sp.

Form of head, antennae, body, and genitalia typical of the Neolygus group, but the glabrous and shining dorsal surface in combination with black and pale transluscent colors, gives the insect a suggestion of a *Deraeocoris.*

♂. Length 6.5 mm., width 2.7 mm. *Head* yellowish brown, median apical portion of tylus blackish, basal half of segments II and III more or less pale. Pale yellowish transluscent to brownish, subbasal margin of pronotal disk, anterior margin of each callus, median basal part of scutellum with bifurcating lines extending apically, clavus except apically and basally on claval vein, diagonal mark across middle of corium and connecting posteriorly with tip of clavus, outer apical half of corium and extending on embolium, narrowly along inner apical angles of corium, and tip of cuneus, dark fuscous to black. *Membrane* pale fumate, pale fuscous within apices of areoles and next to tip of cuneus, veins yellowish. *Femora* with apical half infuscated, apices and subapical annulus pale; tibiae infuscated on basal half of dorsal aspect. *Venter* yellowish to fuscous, a lateral line and basal half of genital segment blackish; genital claspers distinctive, form of right clasper coming nearest to *parshleyi* Kngt.

♀. Length 6.4 mm., width 3 mm.; more robust than the male but otherwise very similar.

Holotype: ♂, June 15, 1924, Santa Rita Mts., alt. 8,500 ft., Arizona (A. A. Nichol); author's collection. *Allotype:* same data as type. *Paratypes:* 3 ♂, 3 ♀, taken with the types; collected by Mr. Nichol on *Quercus reticulata.*

Horcias fasciativentris (Stål).

Calocoris fasciativentris Stål, Stett. ent. Zeit., xxiii, p. 320, 1862.

Calocoris fasciativentris Distant, Biol. Centr. Am., Heter., I, p. 267, pl. 25, fig. 24, 1884.

Form and color very simliar to *Horcias dislocatus rubellus* Kngt., but size larger and pubescence conspicuous. Rostrum attaining posterior margins of hind coxae.

♂. Length 7 mm., width 3 mm. Color orange red to bright red, antennae, tylus, lora, collum, apices of femora, bases and apices of tibiae, a small round spot behind each callus, and a larger one at apex of corium, and membrane, black; genital segment except for spot each side and basal margin of each ventral segment, blackish; tibiae more or less pale on middle.

Records: ♂, July 25, 1922, Douglas, Arizona (H. Letcher); ♂, August 24, 1906, Nogales, Arizona (F. W. Nunenmacher). ♀, Huachuca Mts., Arizona (H. G. Barber).

Horcias fasciativentris imitator n. var.

Color form which is comparable with *goniphorus* Say, but the black on pronotum confined to basal margin, leaving the small round black spots distinct, one behind each callus.

Type: ♀, Huachuca Mts., Arizona (H. G. Barber); author's collection.

Phytocoris strigosus n. sp.

Having the form of the male *canescens* Reuter, but distinguished at once from that species by the banded antennae and white and black scale-like pubescence, the white scales forming a median line on head and pronotum.

♂. Length 5.2 mm., width 1.6 mm. *Head:* width .86 mm., vertex .37 mm.; a spot each side of vertex and median line provided with white scale-like pubescence; pale, middle of tylus, bivittate mark on base of tylus having its origin on frons, dorsal margins of lora and of the strongly projecting juga, fuscous to black. Rostrum, length 2.3 mm., reaching upon fifth or sixth ventral segment, pale, apex blackish. *Antennae:* segment I, length 1.06 mm., black, with three or four large cream colored spots on dorsal aspect, black pubescent, with several erect pale bristles which in length about equal thickness of the segment; II, 2.11 mm., black, pale band at base and a second one having its basal edge nearly at middle of segment; III, 1.74 mm., black, pale at base; IV, 1.06 mm., blackish. *Pronotum:* length .83 mm., width at base 1.33 mm.; basal margin and median line indicated by white scale-like pubescence and edged within by black, disk clothed with white and black pubescence intermixed, sub-basal margin with six tufts of prominent black pubescence; basal margin sinuate, broadly and shallowly notched at middle. Scutellum pale, median line, base more broadly, and a line each side of apical half, black; mesoscutum black, a pale mark near each side. Pleura with a longitudinal black line set off by pale. *Hemelytra:* embolar margins subparallel; ground color pale, infuscated with longitudinal lines and spots, the most distinct line following radius; pale areas supporting white sericeous pubescence while the dark areas have chiefly dark pubescence. Cuneus pale, inner edge and apex blackish, having both white and black tufts of pubescence. Membrane conspurcate with fuscous over a white ground color, the fuscous areas broken into numerous small dots and irregularly connected marks, with two fairly distinct white spots on outer margin beyond cuneus, cubital vein yellowish. *Legs:* coxae and more or less at base of femora, pale; hind femora blackish, irrorate with pale, having two nearly complete obliquely set pale annuli on apical half; front femora chiefly pale, the black forming in broken longitudinal lines; tibiae pale, base and apex and two broader bands on basal half, blackish, spines pale to dusky. Venter pale to blackish, sides with distinct longitudinal black line, genital segment black and varied with pale; form of genital clasper very near that of *corticevivens* Kngt., dorsal margin of segment each side with a slender, erect tubercle, far removed from base of claspers.

♀. Length 5 mm., width 1.5 mm. very similar to the male in form and color.

Holotype: ♂, April 19, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Allotype:* same data as type. *Paratypes:* 4 ♂, taken with the types. ♀, May 24, ♂, May 31, 1924, Tucson, Arizona (A. A. Nichol); 2 ♂, July 12, 1917, Deming, New Mexico (H. H. Knight), collected at light; ♂, August, Douglas, ♂, August, San Bernardino Ranch, Cochise County, Arizona, alt. 3,750 ft. (F. H. Snow); ♂, Oct. 23, ♂, Oct. 26, 1915, Tucson, Arizona (J. F. Tucker).

Phytocoris roseotinctus n. sp.

Pale greenish yellow, more greenish on embolium, cuneus, and outer half of corium; each side of claval suture but more broadly on corium, inner half of clavus bordering scutellum, and inner apical angle of corium, roseate red; clothed with silvery to golden sericeous pubescence; form of head, antennae, and genitalia, showing a relationship with *interspersus*

Uhler, but the color characters distinguish these species at once.

♂. Length 6.2 mm., width 1.9 mm. *Head:* width 1 mm., vertex .46 mm.; vertex yellow, vertex and frons clothed with long pale sericeous pubescence. Rostrum, length 2.51 mm., reaching upon fifth ventral segment, yellowish, apex blackish. *Antennae:* segment I, length 1.57 mm., very slightly thicker on basal one-third (.143 mm. thick), beset with several pale setose hairs which in length nearly equal thickness of segment, greenish yellow; II, 2.94 mm., pale yellowish brown, paler at base, finely yellowish pubescent; III, 1.76 mm., yellowish to dusky; IV, 1.38 mm., dusky. *Pronotum:* length .96 mm., width at base 1.74 mm., width of collar .68 mm.; yellow with a tinge of greenish, median line of collar and extending between calli, and narrow basal margin of pronotum, paler. *Hemelytra:* membrane rather uniformly fumate, more brownish within areoles, veins yellowish, outside the areoles rather evenly marked with fine fuscous reticulations; clavus and corium with roseate red as described above. *Legs:* greenish yellow, apical half of hind femora somewhat darkened with fusco-brownish through which the greenish yellow color shows as small closely placed irrorate spots; tibiae pale to greenish, tips darker, spines pale brownish. Venter yellowish, pale pubescent, form of genital claspers very near *corticevivens* Kngt.

Holotype: ♂, August 19, 1924, Sierrita Mts., alt. 4,000 ft., Arizona (A. A. Nichol); author's collection. *Paratypes:* ♂, taken with type. Mr. Nichol collected this species on *Acacia.*

Phytocoris acaciae n. sp.

General color suggestive of *rufus* Van D., but distinguished by stronger pubescence combined with white and black scale-like hairs, and the conspurcate character of membrane.

♂. Length 4 mm., width 1.5 mm. *Head:* width .86 mm., vertex .30 mm. Rostrum, length 2 mm., reaching upon sixth or seventh ventral segment. *Antennae:* segment I, length .80 mm., reddish to fusco-reddish, with four or five pale spots above, spines pale; II, 1.71 mm., reddish yellow, sometimes tinged with fuscous, pale at base and with a more obscure pale band at middle; III, 1.13 mm., fuscous, paler at base; IV, .74 mm., pale fuscous. *Pronotum:* length .74 mm., width at base 1.31 mm.; disk pale fuscous, collar and basal submargin yellowish, basal margin with irregular red line and set with six tufts of black scale-like hairs. Dorsum clothed with prominent yellowish pubescence, intermixed with shorter more recumbent, white scale-like pubescence; tip of claws, tip of corium, and inner margin of cuneus, set with tufts of black scales. Hemelytra and scutellum appearing red although this color is composed of irregular minute flecks and spots, the largest pale area at apex of corium opposite cuneal fracture, darker before the pale spot in some specimens and continuing upon clavus as a clouded area, thus forming a rather broad obscure longitudinal stripe; sometimes the scutellum is red only on median line. Membrane uniformly dark fuscous, conspurcate with tiny spots and irregular marks of pale, veins red. Legs yellowish, apical half of femora more or less red but irrorate with paler spots and patches of reddish yellow; tibiae pale, indistinctly annulated with reddish, spines white. Venter with red, flecked over yellowish, pale pubescent; genital claspers distinctive, a small pale tubercle above base of left clasper, and a very much smaller one above base of right clasper.

♀. Length 4.2 mm., width 1.6 mm.; more robust than the male but very similar in coloration.

Holotype: ♂, July 20, 1917, Texas Pass, Arizona (H. H. Knight); author's collection. *Allotype:* ♀, taken with the type; Cornell University collection. *Paratypes:* 27 ♂ ♀, taken with the types on *Acacia greggi*; 2 ♂, 2 ♀, July 16, 3 ♂, 1 ♀, July 18, Post Creek Canyon, Bonita, Arizona; 3 ♂, 2 ♀, July 15, 1917, Bowie, Arizona; 12 ♂ ♀, nymphs, July 14, Steins, New Mexico (H. H. Knight); found breeding on *Acacia greggi*.

Phytocoris covilleae n. sp.

Form suggestive of *vividus* Uhler, but differs greatly in form of genitalia, longer rostrum, and black scale-like pubescence of pronotum.

♂. Length 5.3 mm., width 2 mm. *Head:* width .83 mm., vertex .31 mm.; lora not angulate as in *vividus*, greenish yellow, front and basal half of tylus infuscated. Rostrum, length 2.31 mm., reaching upon fifth ventral segment, greenish yellow, apical two segments blackish. *Antennae:* segment I, length .88 mm., fusco-yellowish, with several small glabrous spots, black pubescent, spines yellowish; II, 1.97 mm., greenish yellow, dusky apically, finely pubescent; III, 1.28 mm., pale fuscous over yellowish; IV, .83 mm., fuscous. *Pronotum:* length .97 mm., width at base 1.86 mm.; greenish yellow to fuscous, darker around margins, disk clothed with prominent black scale-like pubescence, more thickly near base, and intermixed with white scale-like hairs which are more abundant and somewhat grouped on basal margin. *Hemelytra* and scutellum uniformly greenish yellow, or somewhat tinged with fulvous, tip of scutellum and small spot each side of apex, fuscous; rather densely clothed with white, golden, and black scale-like pubescence, and intermixed with simple, golden yellow pubescence. Membrane black reticulate and irrorate with pale, veins fulvous. Legs greenish to yellowish, apical half of femora fuscous to blackish, the dark color irrorate with numerous small white spots; tibiae dusky with pale spots showing. Venter greenish yellow, sides with faint reddish maculations, genital segment becoming infuscated; genital claspers distinctive, a long slender posteriorly directed tubercle above base of left clasper, right side with a much smaller one.

Holotype: ♂, April 19, 1924, Tucson, Arizona (A. A. Nichol). *Paratypes:* 6 ♂, taken with the types on *Covillea* sp.

Phytocoris nigripubescens n. sp.

Allied to *vividus* Uhler, but darker green in color, and distinguished by the heavy black pubescence on dorsum which is intermixed with silvery sericeous pubescence.

♂. Length 5.4 mm., width 1.8 mm. *Head:* width 1.04 mm., vertex 1.56 mm. Rostrum, length 1.67 mm., reaching to middle of hind coxae. *Antennae:* segment I, length .48 mm., green, black pubescent; II, 2.11 mm., greenish yellow; III, .88 mm., greenish yellow; IV, .57 mm. *Pronotum:* length .86 mm., width at base 1.62 mm. General form similar to *vividus,* but differs distinctly in its vestiture of black hairs intermixed with silvery sericeous pubescence, membrane darker, veins fulvous. Legs uniformly dark green, pubescence and tibial spines pale.

♀. Length 5.2 mm., width 1.9 mm., very similar to the male in form and color.

Holotype: ♂, April 19, 1924, Tucson, Arizona (A. A. Nichol); author's collection. *Allotype:* same data as the type. *Paratypes:* ♂, April 5, 2 ♂, 1 ♀, April 12, ♂, May 3, 1924, Tucson, Arizona (A. A. Nichol).

Phytocoris cuneotinctus n. sp.

Aspect of *consors* Van D., but distinguished by the red cuneus and black scale-like pubescence on hemelytra.

♂. Length 4.5 mm., width 1.7 mm. *Head:* width .91 mm., vertex .40 mm.; white, eyes dark. Rostrum, length 1.74 mm., just attaining posterior margins of hind coxae. *Antennae:* segment I, length .77 mm., set with several white bristles which slightly exceed thickness of segment; II, 1.74 mm.; III, 1.20 mm.; IV, missing; pale greenish white, segment III dusky. *Pronotum:* length .80 mm., width at base 1.43 mm. Pale greenish white, hemelytra minutely freckled with pale dusky, one such spot at base of each hair; cuneus reddish, the color produced by numerous small points of hypodermal red; membrane white, within and without areoles sprinkled with small fusco-brownish spots and reticulations. Clothed with prominent pale pubescent hairs, on dorsum intermixed with white, sericeous, scale-like pubescence; clavus, apical area of corium, and inner edge of cuneus, set with a few black scales which are easily shed. Femora and tibiae showing small spots of white. Genital claspers inconspicuous, a short blunt tubercle above base of left clasper.

♀. Length 4.8 mm., width 1.9 mm.; slightly more robust than the male but very similar in color and vestiture.

Holotype: ♂, July 11, 1917, Mesilla Park, New Mexico (H. H. Knight); author's collection. *Allotype:* taken with type; Cornell University collection. *Paratypes:* 24 ♂ ♀, taken with the types at light; 4 ♂, July 12, 1917, Deming, New Mexico (H. H. Knight), at trap light.

Phytocoris mellarius n. sp.

Very similar to *diversus* Kngt., but slightly larger, distinguished by the white scale-like pubescence on dorsum and the black scales on basal margin of pronotum, tip of clavus, and basal angle of cuneus; general coloration honey yellow.

♂. Length 5.7 mm., width 1.8 mm. *Head:* width 1 mm., vertex .33 mm. Rostrum, length 2.86 mm., reaching to base of genital segment, brownish yellow, apex blackish. *Antennae:* segment I, length .88 mm., honey yellow, spines and pubescence colored similarly, a few small glabrous spots on dorsal aspect; II, 2.49 mm., honey yellow, pale at base; III, 1.17 mm.; IV, .85 mm.; last two segments pale fuscous over yellow. *Pronotum:* length .84 mm., width at base 1.52 mm. General coloration honey yellow, apical angle of corium and inner basal angle of cuneus pale, sometimes with base of hemelytra and spots on middle of corium distinctly white; femora frequently with small white irrorations. Membrane pale yellowish brown, apical half more whitish and with brown color forming in minute dots and irregular reticulations, veins yellowish to red. Dorsum clothed with simple yellowish pubescence, and intermixed especially on head, anteriorly on pronotum, mesoscutum, and basally on hemelytra, with white sericeous, scale-like pubescence; basally on pronotum, tip of clavus and basal angle of cuneus with deciduous, black scale-like pubescence. Tibiae with fairly distinct pale bands each side of middle, spines honey yellow. Genital claspers distinct, right clasper shaped much as in *erectus* Van D., but hook shorter and broader; genital segment without tubercles.

♀. Length 5.7 mm., width 2 mm. Slightly more robust than the male but very similar in coloration; usually the pale to white areas of dorsum are a little more distinct.

Holotype: ♂, August 3, 1917, Grand View, Grand Canyon, Arizona (H. H. Knight); author's collection. *Allotype:* same data as type. *Paratypes:* 3 ♂, 6 ♀, taken with the types. This species was probably collected on some conifer although I do not find the remarks in my notes.

Phytocoris angusticollis n. sp.

Allied to *junceus* Kngt., but much smaller in size; differs in having median line of scutellum pale and in the broken, maculated appearance of the infuscations of the hemelytra.

♂. Length 6.8 mm., width 1.9 mm. *Head:* width 1.07 mm., vertex .28 mm. Rostrum, length 2.54 mm., reaching upon sixth and seventh ventral segment. *Antennae:* segment I, length 1.09 mm., blackish, irrorate with pale glabrous spots; II, 3.05 mm., black; III, 1.5 mm., black; IV, broken. *Pronotum:* length, .91 mm., width at base 1.61 mm.; form and color similar to *junceus.* Scutellum blackish, median line, basal angles and apex broadly, pale, mesoscutum black. *Hemelytra:* pale yellowish and darkened with fuscous, the dark areas invaded by pale marks and irrorations; largest pale area on middle of corium, a small one near base and a nearly quadrate pale spot on apical area. Cuneus pale yellowish, opaque, freckled with reddish, more heavily apically and becoming fuscous. Membrane much paler than in *junceus,* apical half with small fuscous points and spots, larger areole fuscous but paler on middle, cubital vein pale. Legs with more conspicuous pale irrorations. Genitalia much as in *junceus* but right clasper much shorter and broader.

Holotype: ♂, July 27, 1917, Mt. Lemon, Santa Catalina Mts., Arizona (H. H. Knight); authors' collection.

THE NEW YORK STATE LIST OF INSECTS.

It is gratifying to announce that the compilation of the proposed List of the Insects of New York State is now definitely to be completed. Dr. M. D. Leonard, who was appointed Editor-in-Chief while Acting State Entomologist of New York, returned to the Department of Entomology at Cornell University, Ithaca, New York, December last, to again take charge of the project. His entire time will be devoted to the completion of this list and the New York State College of Agriculture has definitely promised publication provided the MS. is ready by June 1, 1925.

It is estimated that over 16,000 species will be listed as definitely occurring in New York, together with as complete distribution data within the State as is known for each species. Several orders are already practically completed. Over one hundred of the leading specialists are actively cooperating. The Editor of the List will greatly appreciate definite New York State records in all groups and will see that full credit is given to every cooperator.

NOTES ON EARLY SPRING COLLECTING OF NOCTUIDAE.

By George P. Engelhardt, Brooklyn Museum.

A striking feature during the preparation of a list covering the Lepidoptera from Long Island has been the scarcity or total absence of records for early spring species of Noctuidae among the collections which have been examined. This condition is apt to be accounted for by the statement that such species are rare, whereas in reality it simply signifies lack of information and indifferent methods of collecting. As a case in hand may serve the capture of over 20 specimens of *Eutolype rolandi,* all taken on the morning of March 31 resting on electric light poles along a wooded section of road in the suburbs of Brooklyn. There had been showers during the night, but snow still lingered in the woods. On subsequent days during April additional specimens were taken in diminishing numbers. Previous records for this moth are few during a long period of years and this, likewise, applies to *Psaphidia resumens* collected under the same conditions and in increasing numbers towards the latter part of April. Many other species could be cited, but it is not intended to deal with long lists of captures, but rather to emphasize the desirability of early spring collecting and to point out methods which have proven most effective.

For the eastern part of the Atlantic seacoast the collecting season for Noctuidae usually is ushered in with the first warm showers in late March or early April. At this season very little is available for the moths in the way of food, excepting perhaps the running sap of trees which may attract a few but in not nearly such numbers as may be taken by sugaring or baiting in late summer and fall. On the other hand, they are readily attracted to strong lights, especially on cloudy, showery nights. This offers an opportunity to collect long series of species of which, otherwise, the chance capture of a single specimen would be looked upon as a lucky find. City dwellers usually have little time for this sort of collecting, but Lepidopterists more favorably located are urged to follow this method persistently and to augment it whenever possible with trap lanterns. Collecting of this kind within recent years has added numerous records to the Long Island faunal list, including several new species.

Without claim to originality, the writer several years ago adopted the method of beating and shaking branches and young trees of oaks which had retained the withered leaves of the previous summer's growth into April. These leaves proved the hiding places of many moths, amongst them *Copipanolis cubilis* and *Jodia rufago,* which species, heretofore the poorest, are now the best represented in all our local collections.

A third and the most lucrative method of collecting spring Noctuidae is on the flowering catkins of pussy willows. In favorable localities, such as the borders of swamps and woodlands, the collector will be surprised at the number of specimens and the variety of species which have come to partake of so fragrant a meal. The moths are on the wing soon after sunset and once the blossoms have been found they are likely to stay. By means of a bull's eye or flashlight, the choicest of the specimens can be readily selected, when a slight tip will cause them to drop into the wide-mouthed killing jar held below. Hundreds of specimens, comprising species of *Xylina, Scopelosoma, Calocampa, Pachnobia, Graphiphora,* etc., etc., might thus be taken on a good night. Spice bush also is moderately attractive, but as the season advances it should pay to visit wild cherry, beach plum and other flowering shrubs and plants as they come into bloom.

For Long Island more intensive early spring collecting is needed in the pine barren regions. Interesting records from these regions include *Merolonche dolli,* known only by four or five specimens collected at light or resting on tree trunks during early April. Another fine record is the capture of two specimens of *Feralia major,* both females, distinguished from the main land form by larger size and greater contrast in coloration. One was taken by Mr. Ernest Shoemaker and the other by the writer resting on the bark of pitch pines at Massapequa, L. I., on April 13, 1919. This extends the southern range of an otherwise northern species.

A New Foodplant of Ischnorhynchus geminatus Say.—This species is ordinarily found in the spring on sweet or black birch (*Betula lenta*) and in the fall on meadow sweet (*Spiraea salicifolia*). Mr. G. P. Engelhardt took it in great numbers in Bergen Beach woods, Brooklyn, N. Y., on October 18, 1924, on seed capsules of fern-leaved foxglove (*Dasiptemon pedicularia*).

J. R. de la Torre-Bueno, White Plains, N. Y.

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages | 1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII

Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XX APRIL, 1925 No. 2

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

sonian Institution
APR 1 6 1925
National Museum

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed April 14, 1925

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1925

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

STUDIES IN N. AM. AEGERIIDAE (LEPID.), Engelhardt 61
SOME WINTER BUGS (Het.), Bueno 70
NEW SPECIES OF FRANKLINIELLA (THYSANOPTERA), Hood 71
NEW N. AM. BUTTERFLIES, Ehrmann 84
NEW SPECIES OF APION AND APTEROMECHUS (COLEOP.), Fall 85
HEMIPTERA FROM S. BERNARDINO MTS., CALIF., Van Duzee 89
DISTRIBUTION OF FERALIA DECEPTIVA McD. (LEP.), Barnes and Benjamin 90
NOTE ON THE SWEET-POTATO BEETLE AND A RELATED MEXICAN FORM, Chittenden 91
SOME AQUATIC HEMIPTERA WITH ONLY FOUR NYMPHAL INSTARS, Hoffmann 93
SYNONYMY OF CERAPODA OBLITA, ETC. (LEPID.), Barnes and Benjamin 95
HERMAN H. BREHM, Rummel 96
A NEW BORBORID FROM MARYLAND (DIPT.), Malloch 97
EDITORIAL: ON A UNIVERSAL LANGUAGE, J. R. T.-B. 97
BOOK NOTE: GALAPAGOS—WORLD'S END, J. R. T.-B. 98

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XX April, 1925 No. 2

STUDIES IN NORTH AMERICAN AEGERIIDAE (LEPIDOPTERA).

By George P. Engelhardt, Brooklyn Museum.

I.

Descriptions and Corrections of Species from Long Island, New York.

Preliminary to a critical revision of the Aegeriidae of North America it seems advisable to begin now the publication of a series of papers dealing in the main with investigations on life histories and such field work as will, it is hoped, induce others to assist in solving the many mooted questions still pertaining to this family of moths. Descriptions of new species, unaccompanied by biological data, for the present will be limited to material submitted by friends and correspondents for determination and naming. To all inclined to co-operate in these investigations, a cordial invitation is extended to freely avail themselves of the author's assistance in the identification of specimens or in methods of collecting.

Synanthedon castaneae Busck versus *Synanthedon pictipes* Grote and Robinson.

The recognition by Mr. Busck of *S. castaneae* as a valid species, I dare say, was based not so much upon differences of structures and coloration from those of *S. pictipes* as upon the biological fact that the first species is a breeder in chestnut, *Castanea dentata,* while the latter attacks cherry, peach and plum. For some time, and in spite of Mr. Busck's carefully drawn up description, I failed to separate satisfactorily my rather long series, including specimens of both species and I felt inclined to agree with earlier investigators that we were dealing with only one species subject to slight variations. Continued critical study of fresh, bred material finally led to the discovery of a dependable character, heretofore overlooked by Mr. Busck and myself, which will serve readily to separate the two species, *viz.*: *S. castaneae* has only one pale yellow annulation on the tibia of the posterior leg located at the tarsal joint; *S. pictipes* has two such annulations, one at the tarsal joint and the other at the second pair of spurs medial to the tibia.

The illustration (plate 31, figure 10) in Beutenmuller's "Monograph of the Sesiidae of N. A." consequently should read *S. castaneae,* female, in place of *S. pictipes,* female.

This species formerly so common is now threatened with extermination should nothing happen to check the steadily advancing destruction of the American chestnut (*Castanea dentata*) due to the chestnut blight.

Synanthedon corni Hy. Edwards.

Examination of the type of *S. corni* discloses that two superficially similar, but biologically widely separated species, have been assembled under one name. The type specimen, captured by Mrs. Hy. Edwards in Purgatory Swamp, Mass., about 1880, was found resting on *Cornus sericea* and, assuming this to be its foodplant, was named *S. corni,* an unfortunate and misleading name, becasue it is not a breeder in dogwood, but a rootborer of the tall, flat-topped white aster, *Doellongeria umbellata,* which fact, however, was established only in recent years. Subsequent to the description other investigators, including Kellicot, Beutenmuller and the writer, confused with this species, and quite excusably so, another which breeds in the branches of maples, principally red maple, and it is this species, in reality without a name, which has been masquerading as *S. corni* in almost all collections.

While it is quite easy to separate the two species when dealing with fresh, bred material, it is equally easy to confuse them when specimens are flown or discolored by grease, a condition to which *S. corni* is especially subject in spite of precautionary measures which may have been taken. Hy. Edwards' description of *S. corni* (Papilio, Vol. 1, p. 190) answers very well for a specimen rather undersized and somewhat rubbed through flight, but the re-description by Beutenmuller ("Monograph of the Sesiidae of N. A." p. 296) undoubtedly was based upon a specimen of the red maple borer and this is confirmed by his illustration (plate 31, fig. 17) which is typical of *S. acerrubri,* the species so named hereafter.

> Hy. Edwards' description of *S. corni* reads: "Costal and posterior margins of forewings, large discal spot, linear internal margin, and narrow margin of hindwings dull black. Palpi, collar and underside of caudal tuft, bright orange. Pectus and fore femora, pale yellow. Antennae black, fuscous at the apical third. Tibiae and tarsi, blackish without, yellow within. Spurs, pale orange. Thorax and abdomen purplish black, the former with a few lateral hairs, and the latter with a slight golden reflection. No bands. Exp. wings. 15 mm. Type, 1 male."

With well above fifty specimens on hand for comparison, it seems advisable to add the following:

> Male: Thorax densely clothed laterally with dull yellow hair. Abdomen black above, not banded, but dusted with pale yellow scales, heaviest on segments 4, 5, 6; below golden yellow. Caudal tuft above orange in center, black at the sides, below entirely bright orange. Legs yellow, shaded with black on tibiae and tarsi.
>
> Alar expanse, average 19 mm.
>
> Female: Antennae black, pale yellow at the apical third. Abdomen above black, but densely shaded with pale yellow scales. Caudal tuft deep orange above and below. Costa of primaries with a scattering of yellow scales, and a yellowish stain between the discal spot and margin of apex. Otherwise like the male.
>
> Alar expanse, 22 mm.

Type, 1 male. Am. Museum Nat. Hist.

Habitat. Purgatory Swamp, Mass. (Hy. Edwards), Woodhaven South, Long Island, N. Y. (Engelhardt).

Its distribution should be looked for along the range of its food-plant throughout the Atlantic Coast and Midwestern States.

Foodplant. Bred from the roots and basal parts of stalks of *Doellongeria umbellata* (tall, flat-topped white aster) in late May and early June, 1921. It is a fairly common species along the borders of a swampy region at Woodhaven, L. I. The males fly about actively on bright, sunny mornings, while the more sluggish females resting on or near the foodplant can be taken with a killing bottle. The eggs are laid singly on the stalks of the growing plants ten inches or less above the soil and the young larva works downward through the pith to the root, attaining full growth in late fall. At this time also preparations are made for the change to pupae in early May by enlarging the larval gallery from the root upward for about two inches, where the stalk is weakened by an inner circular incision and the gallery capped with frass. Just below this incision a round hole leaving only a thin, outward covering of plant tissue permits an easy exit for the emerging imago two or three weeks after pupation. Stalks thus weakened invariably break off at the point of incision during winter storms, leaving a clean-cut, short, upstanding stump, easily recognized by the collector when looking for pupae. Quick action, however, is needed for the pupa is capable of traveling up or down and it will descend well into the root upon disturbance. This provision for movement no doubt is of advantage to the larva and pupa at times when the swamps are flooded. Larvae which have not transformed to pupae by the end of May, experience has shown, invariably have been parasitized by a small ichneumon wasp.

A more natural grouping for *S. corni* would be to place it near *S. bassiformis* and not as has been done with *S. acerni.*

Synanthedon acerrubri new species.

Male: Antennae black, more or less tinged with white or pale yellow before the tip. Palpi orange, black at the tip. Head black, orbits silvery white. Collar orange intermixed with black. Thorax violaceous black above, pale lustrous yellow below; patagia laterally banded with yellow and coxae of forelegs silvery white. Wings transparent; veins, costa, rather broad apical margin of primaries and large discal mark black, apex with violaceous reflection; below same as above, but veins and costa washed with yellow. Abdomen: above steel blue or violaceous, segments 2, 4, 5, 6 narrowly banded whitish or pale yellow; underside segments 2, 4, 5, 6 entirely whitish shading to pale yellow laterally. Anal tuft bright red intermixed with black above, below uniformly bright red, claspers yellow. Legs: outward femora, anterior part of tibiae and tarsi blue-black mixed with yellow scales and tarsi banded yellow at the joints, posterior part of tibiae between the spurs solid blue-black; inward femora, tibiae and tarsi yellow, excepting a blue-black area between the spurs, which are yellow.

Alar expanse, 18 mm.

Female, apical third of antennae prominently shaded with white. Abdominal segments 4, 5, 6 often, but not always, dusted with yellow scales in addition to yellow bands. Anal tuft bright red above and below; otherwise like the male.

Alar expanse, 20 mm.

Habitat. North Atlantic and Midwestern States. Fairly common in the vicinity of New York City and on Long Island.

Type. Described from five males and seven females. Holotype male and Allotype in the author's collection at the Brooklyn Museum. Co-types U. S. Nat. Mus., Am. Mus. Nat. Hist., William Barnes Collection.

Foodplant and habits. Red maple is the foodplant in woodlands and swamps, but other maples planted as shade trees also are attacked. The larva bores under the bark preferring the branches to the tree trunks. Where a larva is working singly the place of infestation is indicated by a slight swelling and a roughening of the bark. Quite often advantage is taken of the ugly scars left from the borings of the leopard moth (*Zeuzera pyrina*) and such scars may shelter six or more larvae, thereby contributing to the killing of the limb. Otherwise the larval habits are much like those of the common maple borer, *S. acerni.* Wintering in its gallery the larva resumes feeding in the spring, changing to pupa within an oblong cocoon of castings and chips during May or June. The adults emerge in June and July. Occasionally a moth may be collected, attracted by light, which, however, does not signify nocturnal habits, but is merely an accident.

The author invites the submission of specimens determined as *S. corni* for vertification or correction.

Synanthedon viburni new species.

Male: Antennae black with metallic bluish sheen above. Palpi black above, pale yellow below, excepting the tip which is black. Head black, heavily clothed with bristling hairs forming a pale yellow patch between and in front of the eyes; a narrow pale yellow fringe of stiff hair encircles the head posteriorly. Collar black with steel-blue reflections. Thorax black with cupreous reflections and a pale yellow patch on each side beneath; patagia black, inner margin narrowly bordered with pale yellow. Metathorax dorsally intermixed with yellow. Forewings transparent, veins, mar-

> gins and cilia black, costa with few pale yellow scales interspersed, increasing at apex; discal mark rectangular oblong, distinctly black; underside of forewings same as above. Hindwings transparent, veins black, vein A. 2 claviform, broadest at apex. Abdomen black with steel-blue reflections; segment 2 narrowly bordered with pale yellow above; a small, pale yellow patch on each side of segment 4, lateral tufts sparsely intermixed with pale yellow hair. Legs steel-blue; coxae laterally bordered with very pale yellow; femora, tibiae and tarsi banded white at the joints. Spurs white.
>
> Alar expanse, 18½ mm.
>
> Female: Like the male except: antennae prominently pale yellow before the tip, costa and margin of forewings more profusely intermixed with pale yellow scales, patagia broadly bordered with pale yellow, abdominal segment 2 dorsally covered with pale yellow scales to half its width and a scattering of scales of the same color on segment 3.
>
> Alar expanse, 22 mm.

Habitat. Woodhaven South, Long Island, N. Y. IV. 19. 1919, V. 10. 1921. Old Neck Road, Flatbush, Long Island, V. 4. 1919. Brooklyn Botanic Garden, Brooklyn, N. Y. V. 1920.

Foodplant. *Viburnum dentatum* (arrowwood) and on horticultural varieties of *Viburnum*.

Types. Male and female, in the author's collection at the Brooklyn Museum, Co-type male U. S. N. M., Co-type female William Barnes Collection.

Bred from the canes and branches of *Viburnum dentatum* obtained in swampy thickets at Woodhaven, L. I., and from horticultural varieties of *Viburnum* in parks and gardens of Brooklyn. It is an annual species, the larva living under the bark and not in the solid wood, preferably in such parts of the foodplant where abrasions or gall growths have caused distortion and swellings. Pupation takes place in early May in an oblong cocoon of small bits of wood and frass constructed within the sinuous larval gallery under the bark. The moth emerges in late May or early June. While locally not uncommon, the larvae are much subjected to the attacks of an ichneumon and breeding experiments thus far have resulted in more parasites than moths.

In general this species bears a close resemblance to the lesser peach tree borer, *S. pictipes*, and where specimens are flown and rubbed a separation may be difficult. Distinguishing features are the pale yellow fringe encircling the head posteriorly, the broader margins on the primaries and the brighter steel-blue luster on the abdomen. The prominent white area before the tip of the female antennae, moreover, will readily serve to separate this sex from *S. pictipes* which has unicolored antennae in both sexes.

The occurrence of *S. viburni* on horticultural shrubs of Viburnum gave rise to a consideration of the possibility of dealing with an introduced species. But this possibility appears to be excluded, as it bears no resemblance to *S. andrenaeformis* of Europe, the only other Aegirid recorded as boring in Viburnum. Further investigations should prove it an indigenous species of wider distribution than established at present.

II.

DESCRIPTIONS OF TWO NEW WESTERN SPECIES.

Synanthedon albociliata new species.

Male: Antennae lacking, excepting small basal portions which are black. Palpi above black with tips entirely so; below snowy white, this color extending over the coxa and trochanter of the forelegs. Head black, hairy above intermixed with a few white hairs. Collar narrow, dull white. Thorax black with a lateral frings of coarse, white hair above and of white scales below the base of wings. Abdomen black with a scattering of white scales on the fourth segment dorsally and with the fourth, fifth and sixth segments white ventrally. Anal tuft black above, mixed with sordid white below. Femora and tibiae of hindlegs densely clothed with coarse hair, black and sordid white intermixed; tarsi sordid white. Broad costa, outer and inner margins and large discal mark of forewings deep black, the clear spaces between the veins suffused with white reflections; cilia white. Hindwings transparent with faint reflections of white; veins and narrow margins black, cilia white; underside of forewings heavily shaded with white scales. Alar expanse, 18 mm.

Female: Antennae black with steel blue luster. Thorax with two narrow, lateral stripes, yellowish white. Abdomen black with posterior half of fourth segment yellowish white. Anal tuft, ventral parts of abdomen and hindlegs all black. Forewings heavily shaded with black, streaked with white along the inner margins and before the discal mark. Cilia brownish black. Hindwings transparent between veins and broad margin which are black. Otherwise like the male. Alar expanse, 20 mm.

Habitat: Kerrville, Texas, October, 1916.

Foodplant and habits not known. Mr. H. Lacey, the collector, since removed from Texas, reported that the specimens were taken among some weeds on his ranch. This, together with the lateness of the season, indicates that the species is a rootborer in some perennial plant, possibly one of the Eupatorieae.

Type, male, allotype, female, and two paratypes, females, William Barnes collection; two paratypes, females, G. P. Engelhardt collection at the Brooklyn Museum.

Synanthedon auritincta new species.

Male: Antennae black with a small white area on upper surface near the tip. Palpi black above, pale yellow below, excepting the third joint which is black. Head black violaceous; front black with a triangular white patch above clypeus and the eyes broadly bordered with white below the antennae. Collar golden yellow above, white at the sides and below. Thorax above black violaceous with two broad lateral stripes and posterior margin golden yellow; below two broad yellow lateral stripes connecting with the stripes above anteriorly but not posteriorly, otherwise white. Coxa and trochanter of forelegs shiny white. Middle and hindlegs outward violaceous black with white annulations at the joints and spurs; inward dusted with white to tibial spurs; spurs white. Forewings transparent, costa, broad apical margin, large discal mark and veins black, slightly violaceous. Cilia dull black. Hindwings transparent, veins black, cilia dull black, gradually shading to white at the base. Under surface of wings same as above, except a yellow dusting on costa and more slightly on apical margin and discal mark. Abdomen violaceous black with a narrow yellow band on segments, 2, 3, 4, 6 and 7. Caudal tuft steel blue, narrowly fringed with white laterally; ventral parts of segments 1 and 2 dusted with white scales which form a narrow band on segments 4 and 5 and lateral spots on segment 7. Alar expanse, 14–15 mm.

Female: Antennae black, usually but not always marked with white near the tip. Palpi golden yellow above, pale yellow to whitish below. Head black violaceous; face black, bordered with white laterally and posteriorly. Collar golden yellow above, pale yellow or whitish below. Thorax black, heavily shaded with golden yellow laterally, anteriorly and posteriorly; ventral parts also heavily shaded with yellow of a pale hue, sometimes white. Coxa and trochanter of forelegs lustrous yellow or whitish, suggesting a bib. Middle and hindlegs golden yellow, except a violaceous annulation between the spurs of tibia and the tarsus which is violaceous and yellow banded at the joints. Forewings transparent; costa, apical margin, discal mark and veins black violaceous; the space between the veins from apical margin to about half the distance to discal mark heavily shaded with golden yellow, discal mark narrowly bordered outwardly and base shaded prominently with the same color. Hindwings transparent; veins, margins and cilia black, excepting the basal parts which are yellow. Underside of wings with the costa heavily shaded with yellow, otherwise as above. Abdomen violaceous black with narrow golden yellow annulations on all segments, excepting segments 5 and 7 which are all yellow. Ventral parts greatly suffused with yellow but less so on segments 2 and 3. Caudal tuft golden yellow intermixed with black laterally and at base above and below. Alar expanse, average 17 mm.; range 12 to 21 mm.

Habitat: Baboquivari Mts., Pima Co., Arizona, August 1–15, 1923 and 1924. O. C. Poling, collector. Described from eleven specimens, two males and nine females, kindly submitted for determination by Dr. Barnes and Mr. Benjamin. The foodplant and habits are not known.

Type, female, allotype, male, and six paratypes, females, William Barnes collection; one paratype, male and two paratypes, females, Geo. P. Engelhardt collection at the Brooklyn Museum.

The assumption that here a dioecious species is being dealt with is directly supported only by the locality and date which correspond for all the specimens in hand, and therefore is open to doubt. Nevertheless so many western species follow along the lines of sexual divergence as do the present examples that it seems preferable to err on the side of conservatism rather than to add to a nomenclature already overburdened with synonymy. The name "*auritincta*" has been suggested by the rich golden luster on the primaries and on the abdominal bands of the females, which should serve to separate readily this species from all others. The arrangement of the abdominal bands of the males also is distinctive, though less easily recognized, especially where specimens are rubbed or discolored.

SOME WINTER BUGS.

By J. R. de la Torre-Bueno, White Plains, N. Y.

The winter of 1923–24 was singularly open and mild about New York, and so it was possible to collect Hemiptera practically from November to March. These were secured by sifting leaves in swamps mainly, about the edges and around the tussocks. The greater part of the insects secured are Lygaeids with a few odd species of other families here and there.

Acanthia saltatoria L. Dec. 2, 1923, sifted.

Microvelia fontinalis Bueno. Sifted Dec. 22, 1923, and Mar. 9, 1924.

Lygus pratensis L. Feby. 2, 1924. Sifted at base of alders.

Nabis roseipennis Reut.
rufusculus Reut. } Dec. 22, 1923, sifted.

Pygolampis sp. *nymph.* Under hillside stone. Dec. 2, 1923.

Zelus exsanguis Stål. 3rd, 4th and last instar nymphs. Dec. 2, 1923, and Mar. 9, 1924. Sifted.

Piesma cinerea Say. Under hickory bark, Feb. 2, 1924.

Corythucha marmorata Uhler. 1 under a board, Nov. 10, 1924.

Corythucha ciliata Say. Throughout winter under bark of sycamore.

Oedancala dorsalis Say. Dec. 23, 1923, sifted; and Mar. 9, 1924.

Myodochus serripes Oliv. Dec. 23, 1923.

Heraeus plebejus Stål. Nov. 10, 1923, and Dec. 1 and 8.

Ozophora picturata Uhler. Nov. 4 and 11. Sifted from leaves between two rocks on hill.

Antillocoris pallidus Uhler. Common throughout winter, sifting sphagnum and leaves at edge of swamps.

Drymus crassus V. D. First New York record. Dec. 23, 1923. Sifted on edge of swamp.

D. unus Say. Dec. 1, 2 and 22, 1923, and Mar. 9, 1924, sifted.

Eremocoris ferus Say. Dec. 2, 1923. Under stones on hillside.

Scolopostethus thomsoni Reut. Common throughout winter. Sifted from leaves at edge of swamp.

Jalysus spinosus Say. Sifted from leaves under shrubbery on a hillside, Dec. 8, 1923.

Aradus falleni Stål. Feb. 2, 1924, under loose bark of sycamore.

Mormidea lugens Fabr. Dec. 2, 1923, under hillside stones.

Podisus serieventris Uhler. Nov. 4, 1923, sifted. Dec. 2, under stone.

Corimelaena pulicaria Germar. Dec. 23, 1923, sifted.

NEW SPECIES OF FRANKLINIELLA (THYSANOPTERA).

By J. Douglas Hood, University of Rochester.

The grouping of individuals into the human invention known as species becomes in this genus a feat of extraordinary difficulty. In the course of their evolution certain groups into which the genus is divisible have become tolerably distinct, but within several of these groups the differentiation of species seems to be nearly, if not quite, impossible. The small size of the insects no doubt facilitates their dispersal and probably reduces the effectiveness of most of the natural barriers, permitting interbreeding among closely related forms and preventing the crystallization of specific differences.

At any rate, we find that specimens from the tropics of the New World may usually be separated readily into species if little material is at hand; but with the increase in the number of individuals available for study comes the almost complete connection of some of these forms by slight variations in color and structure. For example, the number of bristles on the wing veins might be regarded at first as a distinct structural character for the definition of species; but in many cases we find that the bristles vary in number directly as the size of the wing, whether the difference in size be between individuals of the same or different species.

Furthermore, in nearly every large series, even when taken from a single plant, will be found a few specimens of smaller or larger size, or of paler or darker coloration; and with these differences in size or color will be associated more or less definite structural characters, such as the relative length and stoutness of the bristles and minor variations in the form of the antennal segments and other body parts. Such individuals cannot be considered distinct species, being evidently either mutants or ecological forms of the species with which taken.

In some cases, though, several apparently valid species have been found within a single flower. There is probably some interbreeding at such times between forms which, though closely related, we have every reason to consider distinct, and some of the puzzling intergrades may have been so produced. In the absence of definite, experimental evidence to the contrary, however, we must continue to recognize such forms as worthy of separate names.

An appalling amount of breeding work must be done by the entomologists of the future before we shall know the proper status of the various groups of individuals now known as species. The systematic worker is perhaps to be forgiven if, at times, he feels discouraged in his attempts to fit a rigid nomenclature to any group of living things which, by the very nature of their origin can never be neatly pigeon-holed, knowing as he does that his work, no matter how carefully and conscientiously performed or upon what wealth of material based, must eventually be overhauled to its very foundations.

It will be noticed that the species here described are distributed among four major divisions of the genus which are separated in part on the structure of the pedicel of the third antennal segment. This character has not heretofore been used in diagnosing species but is one which, notwithstanding its minuteness, has been found most satisfactory in the definition of Groups *tritici* and *cephalica,* below. It is interesting to note that *F. tritici* (Fitch) and *F. occidentalis* (Pergande), said by some authors to be inseparable from each other, fall into different groups, the character of the pedicel providing a ready and gratifying means for their separation.

The prolongation of the second antennal segment at its apex is a second valuable character. It occurs in *F. cephalica* (Crawford)[1] (=*Euthrips tritici* var. *bispinosus* Morgan,[1] =*Euthrips tritici* var. *projectus* Watson[1]) and a few of its closest relatives. Without some experience it may be difficult to detect this prolongation in dorsal view, though it is quite evident when seen from the side. Notwithstanding this disadvantage, it is apparently an adequate character for the definition of a subordinate group of species (Group *cephalica,* below) which is closely related in the form of the pedicel of the third antennal segment to the *tritici* group.

A third useful structure is found in the armature of the ninth abdominal tergite of the male. This character appears first to have been used by the present writer in the differentiation of *F. williamsi* (Ins. Insc. Menstr., Vol. III, 1915, p. 21) and has subsequently been adopted by Bagnall in the separation of *gemina, distinguenda, melanommata,* etc. In the present instance it has proved most useful in the definition of *difficilis* and *cubensis.*

It might be remarked that, of the four groups recognized, the first, second, and fourth occur only in the Americas, in so far as known. The third group is very much the largest, embracing all of the European and African species studied—although the definition of that group in respect to wing coloration, at least, will doubtless require some modification.

---

[1] Authentic material (usually cotypic or paratypic) is before me.

In addition to the synonyms given above for *F. cephalica* (Crawford), it might be pointed out that the name *F. tenuicornis* (Uzel)[1] should be used for the species which Hinds[1] called *Euthrips nervosus* (Uzel). *Thrips* (*Euthrips*) *maidis* Beach[1] is the same insect.

I must acknowledge my very deep obligations to the following entomologists and zoologists who have supplied most of the many thousands of specimens of this genus which have been examined: J. W. Bailey, G. E. Bodkin, L. C. Bragg, Patricio Cardín, Bert R. Coad, R. A. Cooley, Charles A. Hart, M. M. High, W. A. Hooker, L. O. Jackson, E. R. Kalmbach, W. L. McAtee, H. K. Plank, H. M. Russell, E. W. Rust, James Silver, Jr., Alexander Wetmore, C. B. Williams, and James Zetek.

The types are in the author's collection.

Genus *Frankliniella* Karny.

I.—Interocellar bristles distinct, decidedly (often many times) longer than diameter of ocelli; pedicel of third antennal segment with an abrupt, subbasal thickening which, in profile, usually appears as an angulation on either side of the pedicel (Pl. III, figs. 1, 3, 5, 7);[2] second antennal segment not thickened on dorsum at apex nor prolonged, the two bristles there situated not short and thickened ....Group *tritici*.

Frankliniella difficilis sp. nov. (Pl. III, figs. 1 and 2.)

Female (macropterous).—Length about 1.4 mm. Color pale yellow (nearly white); antennae with distal half of segment 4 and all of 6–8 gray brown, 2 often darkened apically, 1 nearly colorless; ocellar pigment bright red; wings faintly yellowish; all bristles brown. The four pairs of major pronotal bristles subequal, nearly half the length of pronotum and only slightly longer than interocellars. Length of antennal segments in microns: 1, 30; 2, 44; 3, 59; 4, 49; 5, 36; 6, 46; 7, 9; 8, 13.

---

[2] The only figure of this structure in the literature is that given by Williams, Journ. Econ. Biol., Vol. 8, 1913, p. 214, fig. 2, c.

Male (macropterous).—Smaller, slenderer, and somewhat less yellowish than female. Tergite 9 with a pair of short, approximate, rather stout bristles behind middle, and a pair of somewhat *shorter* and more slender bristles external and anterior to these; macrochaetae at sides of tergites 9 and 10 particularly heavy and dark.

Guadeloupe and Martinique, French West Indies; in various flowers, by sweeping, etc.; C. B. Williams.

Evidently closely related to *F. tritici* (Fitch), but separable by the paler coloration, longer anterior marginal bristles, much longer antennal style, and, especially, the differently armed penultimate abdominal tergite of the male. This last character distinguishes it readily from *gemina* and *distinguenda,* while the long anterio-marginal bristles exclude it from *cephalica* and *melanommata,* all of which agree with *difficilis* in coloration though they do not belong to the same group.

II.—Like I, except that the second antennal segment is thickened on dorsum at apex and slightly produced, and bears two rather prominent, somewhat thickened bristles Pl. I, fig. 7)[3] .... Group *cephalica.*

a.—Color pale yellow.

Frankliniella cubensis sp. nov. (Pl. III, fig. 3.)

Female (macropterous).—Length about 1.1 mm. Color pale yellow (nearly white); antennae with distal half of segment 4 and all of 6–8 gray-brown, 2 darkened apically, 1 nearly colorless; ocellar pigment bright red; wings colorless; all bristles pale brown. The four pairs of pronotal bristles subequal, about half the length of pronotum; interocellars distinctly shorter. Length of antennal segments in microns: 1, 26; 2, 40; 3, 52; 4, 43; 5, 36; 6, 43; 7, 6; 8, 12.

Male (macropterous).—Smaller, slenderer, and somewhat less yellowish than female. Tergite 9 with a pair of short, approximate, rather stout bristles behind middle, and a pair of somewhat *shorter* and more slender bristles external and anterior to these; macrochaetae at sides of tergites 9 and 10 light brown, short and moderately stout.

---

[3] For other illustrations of this structure see Crawford, Pomona Coll. Journ. Ent., Vol. II, 1910, No. 1, p. 154, fig. 63, B, and Williams, *l. c.*

Cuba; in flowers of citrus and *Carissa acuminata;* Patricio Cardín.

Related intimately to *cephalica* and *melanommata,* but easily known in the male by the armature of the ninth abdominal tergite, and in the female by the long anterior marginal bristles. *Cubensis* has the pedicel of segment 5 of the antennae unusually narrow at the base.

aa.—Color brown; pronotal bristles subequal, half as long as pronotum, very slightly, if at all, longer than interocellars.

Frankliniella zeteki sp. nov. (Pl. III, fig. 5.)

Female (macropterous).—Length about 1.1 mm. Color light brown, apex of abdomen darkest; femora brown, yellow at base and apex, the fore pair yellow along inner surface also; tibiae and tarsi yellow, hind tibiae brown across middle; antennae with segments 1, 2, and 4–8 brown, 2 darkest, 3 brownish yellow, 4 and 5 paler basally; wings nearly uniform pale brown; ocellar pigment red. Head 1.5–1.9 times as wide as long; segment 3 of antennae with pedicel less than twice as long as greatest width; length of antennal segments in microns: 1, 24; 2, 36; 3, 64; 4, 51; 5, 39; 6, 51; 7, 10; 8, 17.

Chepigana (Darien), Panama; James Zetek; no data on habitat, though almost certainly from flowers.

The closest relative of this species is *parvula,* a very common Neotropical form with which it agrees in all respects, apparently, excepting the much shorter third antennal segment with its shorter and stouter pedicel, the decidedly shorter head, the stouter and more prominent postocular bristles, and the average darker color of the antennae.

Named after my good friend, Mr. James Zetek, who collected it.

Frankliniella parvula Hood. (Pl. III, fig. 7.)

This name is inserted here to facilitate reference to the figure of the antenna given on the accompanying plate.

III.—Interocellar bristles distinct, decidedly longer than diameter of ocelli; second antennal segment normal; pedicel of third antennal segment without abrupt subbasal thickening (Pl. III, figs. 6, 8, 9, 10); wings, when not pale, either dark brown and distinctly paler at base or uniformly and lightly washed with brownish or grayish, never uniform dark brown in color .... Group *intonsa.*

a.—Antennae of normal form, not noticeably short and stout; segments 7 and 8 together about one-half as long as segment 6; 8 long and cylindrical (Pl. III, fig. 11.)

b.—Antero-marginal bristles half as long as pronotum and subequal to those at posterior angles.

c.—Color brown; interval between posterior ocelli three times their diameter.

Frankliniella panamensis sp. nov. (Pl. III, fig. 8.)

Female (macropterous).—Length about 1.4 mm. Color brown, shading from yellowish brown in head to blackish brown at tip of abdomen; pterothorax with bright orange-red hypodermal pigmentation; antennae rather uniformly brown, the basal half or more of segment 3, basal third of 4, and usually an indistinct ring just beyond pedicel of 5, yellowish; legs paler than body, tibiae and tarsi yellow, the former more or less shaded with brown; forewings distinctly darkened with brown, uniform in color; ocellar pigment orange-red. Head about one and one-fourth times as wide as long, with a narrow black line along extreme posterior margin; interval between posterior ocelli three times their diameter; interocellar bristles nearly half as long as pronotum, only slightly shorter than antero-marginals. Wings long, with about 29, 23, and 18 bristles on costa, anterior vein, and posterior vein, respectively. Antennae slender, intermediate segments elongated, 3 fully three times as long as wide, 8 long and slender; length of antennal segments in microns: 1, 32; 2, 48; 3, 72; 4, 60; 5, 46; 6, 56; 7, 10; 8, 16.

Boquete, Panama, February 28 and March 3, 1914; in flowers; James Zetek.

Close to *occidentalis*, but apparently distinct enough to require a separate name. Recognizable by the more slender antennae, larger pronotal and interocellar bristles, and the longer and much darker wings.

cc.—Color yellow; interval between posterior ocelli twice their diameter.

Frankliniella ameliae sp. nov. (Pl. III, fig. 6.)

Female (macropterous).—Length about 1.3 mm. Color lemon yellow, pterothorax tinged with orange, abdominal tergites with a gray blotch at middle; legs concolorous with body; antennae with segment 1 and bases of 3, 4, and 5 yellow, remainder dark brown; wings uniform pale brown; all body and wing bristles brown. Head narrowed basally, about 1.2 times as wide as long, without dark line at base; interocellar bristles distinctly less than half as long as pronotum, much shorter than antero-marginals. Wings rather long, with about 23, 19, and 15 bristles on costa, anterior vein, and posterior vein, respectively. Antennae moderately slender; segment 3 three times as long as wide, 8 long and slender; length of antennal segments in microns: 1, 30; 2, 42; 3, 51; 4, 47; 5, 40; 6, 53; 7, 10; 8, 16.

Male (macropterous).—Smaller, slenderer, and somewhat less yellowish than female. Tergite 9 with a pair of rather short but slender, approximate bristles near posterior margin, and a pair of bristles, twice as long and somewhat stouter, external to them and on the same transverse line; macrochaetae at sides of tergites 9 and 10 dark brown, short and moderately stout.

Boquete, Panama, February 28 and 29, 1914; in flowers; James Zetek.

Perhaps closest to *williamsi*, but separable in the female by the darker colored bristles and wings, the orange tinted pterothorax, the presence of abdominal brown blotches, the more approximate posterior ocelli, and the very differently colored antennae. The male has the ninth abdominal tergite of much the same structure as that of *williamsi*, but the median pair of bristles are longer and slenderer, and the macrochaetae at the sides of the tergites are very much longer, stouter, and darker.

bb.—Antero-marginal bristles very small, not more than one-fourth as long as pronotum, hardly half as long as bristles at posterior angles.

c.—All bristles pale yellowish, slender and inconspicuous, postoculars short, subequal to antero-marginals, less than half as long as those at posterior angles of pronotum; segment 7 of antennae very little, if at all, more than half as long as 8; abdomen with a very delicate, sparse comb on posterior margin of tergite 8.

Frankliniella exigua sp. nov. (Pl. III, fig. 9.)

Female (macropterous).—Length about 1.0 mm. Color nearly uniform pale yellow, legs somewhat paler than body, wings clear; antennae with segment 1 nearly colorless, 2 lightly brownish, 3–5 about concolorous with head, infuscate apically, 6–8 brown-gray, 6 paler at base; ocellar pigment orange. Head about 1.2 times as wide as long; interocellar and postocular bristles slender, inconspicuous, and nearly colorless, the postoculars subequal to antero-marginals; eyes small, about as long as their distance from posterior margin of head. Prothoracic bristles short, those at posterior angles longest but less than half the length of pronotum. Fore wings with about 23, 17, and 13 bristles on costa, anterior vein, and posterior vein, respectively. Antennae moderately slender; stylus long, the eighth segment quite slender and nearly twice as long as 7; measurements of antennal segments in microns: 1, 24; 2, 31; 3, 42; 4, 38; 5, 31; 6, 44; 7, 7; 8, 14.

Grant, Colorado, July 24, 1916; sweeping; L. O. Jackson.

F. helianthi (Moulton) and *F. gossypii* (Morgan) are the only North American species with which this slender little form seems comparable. In *helianthi*, however, the body bristles are described as "large, brown, and conspicuous"; while *gossypii* has the antero-marginal bristles well developed. *Exigua* is suggestive of the Neotropical *distinguenda*, which, however, has the terminal antennal segment much shorter.

cc.—All major bristles brown, moderately stout, and conspicuous; postoculars minute (Pl. III, fig. 4), pale, hardly half as long as the much darker and heavier antero-marginals, which themselves are not nearly half as long as those at the posterior angles of pronotum; segment 7 of antennae decidedly more than half as long as 8; abdomen without trace of comb on posterior margin of tergite 8.

Frankliniella genuina sp. nov. (Pl. III, fig. 4.)

Female (macropterous).—Length about 1.1 mm. Color pale yellow, thorax obscurely mottled with brown, usually darker in last two or three segments with a large, irregular, brown blotch on each tergite; wings nearly clear; legs concolorous with body, lightly shaded along outer surface with pale brown; antennae with segment 1 nearly clear; 2 yellow, darkened with brown; 3–5 yellow at base, successively slightly darker, shaded apically with brown; 6–8 blackish brown. Head about 1.2 times as wide as long; interocellar bristles decidedly longer than antero-marginals, rather stout, dark and conspicuous; eyes much longer than their distance from posterior margin of head. Prothoracic bristles short, stout, dark brown, less than half the length of pronotum, the inner of the two pairs at posterior angles longest. Fore wings with about 23, 17, and 13 bristles on costa, anterior vein, and posterior vein, respectively. Antennae moderately slender; stylus long, the eighth segment quite slender but not twice as long as 7; measurements of antennal segments in microns: 1, 24; 2, 36; 3, 43; 4, 40; 5, 36; 6, 49; 7, 10; 8, 14.

Mission, Texas, June 26 and September 8, 1914; on *Echinochloa colona* and an unidentified plant ("Plant No. 9"); J. W. Bailey.

The specific name of this form has reference to the most important character in the recognition of the species—the greatly reduced postocular bristles, which are minute and pale in marked contrast with the interocellar and antero-marginal pairs. This character separates it sharply (at least in the material before me) from *helianthi, gossypii,* and *exigua,* to which it is closely related.

aa.—Antennae short and stout; segments 7 and 8 together very much less than one-half as long as segment 6; 8 short and conical rather than cylindrical (Pl. III, fig. 10.)

Frankliniella bagnalliana sp. nov. (Pl. III, fig. 10.)

Female (macropterous).—Length about 1.1 mm. Color quite uniformly dark brown, somewhat darker posteriorly; femora nearly concolorous with body basally, apices yellow; tibiae and tarsi yellow, the former sometimes slightly clouded with brownish at middle; antennae with segments 1, 2, and 6–8 brown; 3 yellow, shaded lightly with brown apically; 4 and 5 successively darker and more heavily shaded with brown, 5 at apex about concolorous with 6; fore wings brown, distinctly paler at base. Head about 1.2 times as wide as long; pronotal bristles subequal and a little less than one-half the length of pronotum, the antero-marginals slightly shorter than the others; fore wings densely pilose throughout, with about 27, 21, and 20 closely spaced bristles on costa, anterior vein, and posterior vein, respectively. Antennae stout, about twice as long as head, almost exactly as in *F. oxyura* Bagnall,[4] except that the stylus is decidedly shorter; length of antennal segments in microns: 1, 24; 2, 34; 3, 46; 4, 40; 5, 28; 6, 40; 7, 7; 8, 9.

Boquete, Panama, February 28, 1914; in flower; James Zetek, [No. 210].

In much the same way that the following species serves to connect *Frankliniella* with *Taeniothrips,* the present species links the group in which it is here placed with the one which follows. The form and general structure of the body and the character of the antennae place it with *oxyura, achaeta, minuta,* etc., to which it is most closely related and where it really belongs; but the long interocellar and pronotal bristles and the coloration of the wings make it difficult to form a suitable definition for that group if it be placed there. In addition to the characters just mentioned, the short antennal style and closely bristled veins of the fore wings are distinctive.

This distinct and interesting little form is named after Mr. Richard S. Bagnall, of Newcastle-on-Tyne, England, whose work on the Thysanoptera is familiar to entomologists everywhere.

IV.—Interocellar bristles minute and inconspicuous, shorter than diameter of ocelli and barely visible (Pl. III, fig. 12); pedicel of third antennal segment without abrupt subbasal thickening; wings dark, not distinctly paler at base; segments 3 and 4 of antennae not pale yellowish, segment 8 slender .... Group *minuta.*

a.—Sternite of segment 3 of abdomen of female without an elliptical pale area; posterior margin of pronotum with *one* pair of large bristles in addition to the two usual pairs at posterior angles; *antero-marginal bristles and those at the anterior angles of pronotum minute and hardly recognizable as macrochaetae.*

---

[4] See Priesner's illustration of this species (= *F. minuta* var. *paraguayensis* Priesner) in Deutsch. Ent. Zeitschr., 1921, p. 189.

Frankliniella achaeta sp. nov. (Pl. III, figs. 11 and 12.)

> *Female* (macropterous).—Length about 1.2 mm. Color dark brown, nearly black to the naked eye; legs concolorous with body, except fore tibiae and all tarsi, which are light brown or yellowish; antennae with segments 1, 2, and 5–8 concolorous with body, 4 paler, 3 decidedly paler and yellowish; fore wings uniform dark brown save for a small, pale spot just beyond scale. Head long, about 0.9 as long as wide; pronotum with distinct anastomosing lines of sculpture; fore wings densely pilose throughout and with 14 to 16 bristles on anterior vein, these bristles distantly spaced beyond middle of wing. Antennae of the usual form and structure found in this section of the genus,[5] but with the intermediate segments somewhat more elongated; segment 8 particularly long and slender, three times as long as wide; length of antennal segments in microns: 1, 22; 2, 30; 3, 40; 4, 35; 5, 30; 6, 42; 7, 9; 8, 13.

Grant, Colorado, and " Colorado "; taken by sweeping; L. O. Jackson.

Allied to *oxyura, minuta,* etc., but differing widely from them and from all other described species of the genus by the greatly reduced bristles on the anterior margin, and at the anterior angles, of the pronotum. In this respect it violates our definition of the genus itself and furnishes a most interesting transitional form between *Frankliniella* and *Taeniothrips,* indicating the manner in which the latter genus might possibly have originated from a close relative of the former—by the reduction and loss of the various bristles on the pronotum and wings. There cannot be the slightest doubt that this species belongs in the genus to which I have assigned it, so close is the structure of all parts of its body to *minuta, oxyura,* and *tympanona.* A real convenience might be served, however, could it, without violence to a genetic classification, be assigned to *Taeniothrips* instead of *Frankliniella.*

---

[5] The only accurate figure of a species of this group is given by Priesner, Deutsch. Ent. Zeitschr., 1921, p. 189.

EXPLANATION OF PLATE III.

(J. D. H. del., camera lucida.)

Fig. 1.—*Frankliniella difficilis* sp. nov. Segment 3 of left antenna, ♀, paratype.

Fig. 2.—*Frankliniella difficilis.* Tergite 9 of abdomen, ♂, paratype.

Fig. 3.—*Frankliniella cubensis* sp. nov. Segment 3 of right antenna, ♀, holotype.

Fig. 4.—*Frankliniella genuina* sp. nov. Head, ♀, holotype.

Fig. 5.—*Frankliniella zeteki* sp. nov. Segment 3 of left antenna, ♀, holotype.

Fig. 6.—*Frankliniella ameliæ* sp. nov. Segment 3 of left antenna, ♀, paratype.

Fig. 7.—*Frankliniella parvula* Hood. Segments 1–3 of antenna and a portion of head (seen from side), ♀, paratype.

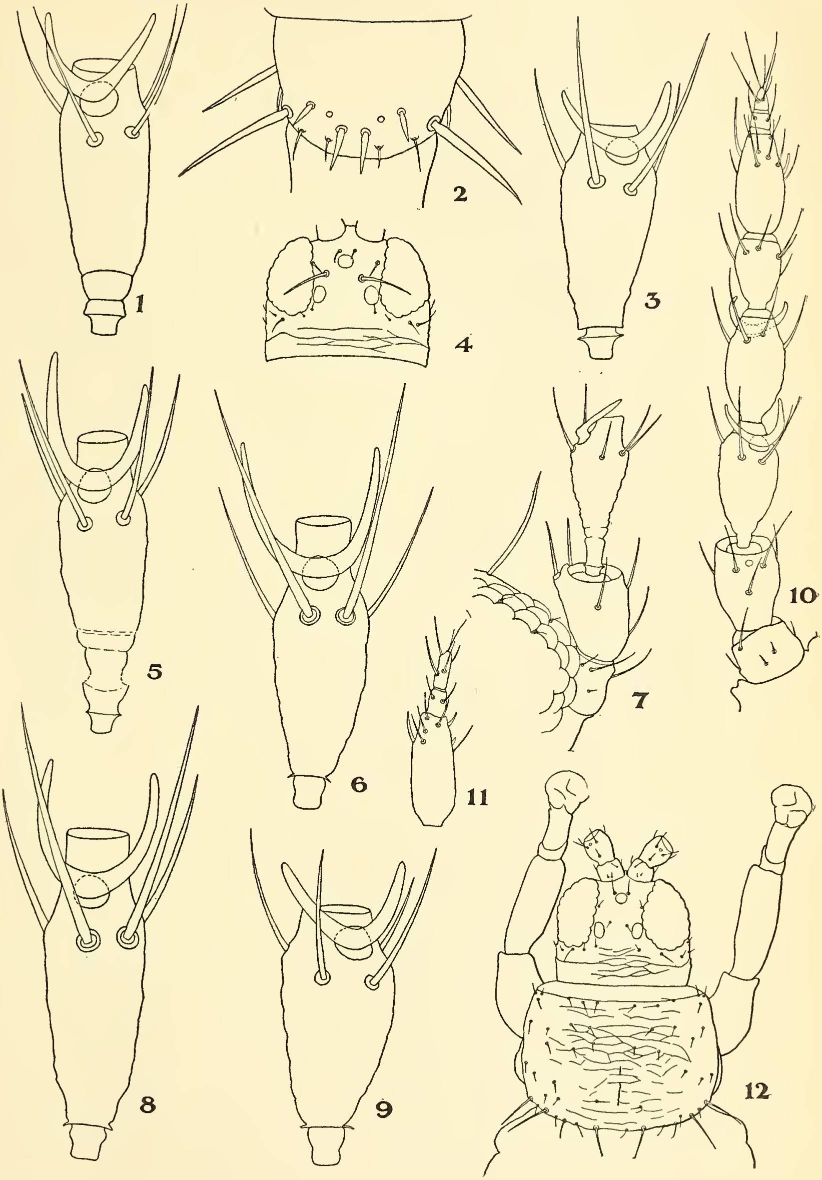
Fig. 8.—*Frankliniella panamensis* sp. nov. Segment 3 of left antenna, ♀, holotype.

Fig. 9.—*Frankliniella exigua* sp. nov. Segment 3 of right antenna, ♀, holotype.

Fig. 10.—*Frankliniella bagnalliana* sp. nov. Right antenna, ♀, holotype.

Fig. 11.—*Frankliniella achœta* sp. nov. Segments 6–8 of right antenna, ♀, paratype.

Fig. 12.—*Frankliniella achœta.* Head and prothorax, ♀, paratype. (Bristles on legs and between facets of eyes omitted.)


1
2
3
4
5
6
7
8
9
10
11
12

Frankliniella—Hood

NEW NORTH AMERICAN BUTTERFLIES.

By George A. Ehrmann, Pittsburgh, Pa.

Papilio ehrmanni n. ab.

> *Male:* forewings submarginal row of yellow spots are almost obliterated, marginal band of spots very minute. Hindwings discal band almost wanting and what is left of it is heavily shaded with black scales. Underside normal, but the fulvus spots are greatly reduced.

This form of *P. asterias* is very interesting and is the very counterpart of *P. melasina* R. & J. from South America of which I have specimens in my cabinet. *P. melasina* is an aberrant form of *P. americus* Koll. while *P. ehrmanni* is an aberrant form of *P. asterias* Fabr., thus showing this wonderful study of divergence and convergence in the two extreme forms. Captured 5/15, Hammett Place, Alleghany Co., Pa., by Al. J. Ehrmann.

Eurema biedermanni n. sp.

> *Male:* allied to *E. mexicana* Bois. and *E. boisduvaliana* Feld. group. Antennae pink with the knobs brown. Head fulvous, thorax and dorsal part of abdomen black. Lateral underside of abdomen and underside of thorax yellow. Ground color of forewings from the base to a little beyond the discal cell cream, outer part shading black along the inner margin but not so far as it does in the above two mentioned species and on the outer end of this yellow extension there is a yellow triangular spot. Base and costa slightly dusted with black. Hindwings from the costa to below discal cell lemon color, from lowerside of the discal cell cream color, outer black margin beginning from the apex and extending to the sharp point of subanal angle. This black margin on the inner side is pointed towards the discal cell. Fringes on both pairs of wings whitish. Underside of forewings pale yellow, shaded on the base and apex with a beautiful tint of lemon, and very faint black discal spot. Underside of hindwings ground color dark lemon almost orange. It is not dusted with pinkish scales as it is in both those compared species. There is a small pinkish spot on the costa near the apex and a subdiscal bar. Also a spot near the abdominal margin and two smaller spots below the bar. These are all of the same color as the costal spot. Fringes white shaded with pink. Exp. 2 in.

Type: Male, Palmerlees, Arizona, Aug. 3, 1909; in Coll. Ehrmann.

NEW SPECIES OF APION AND APTEROMECHUS.

By H. C. Fall, Tyngsboro, Mass.

About four years ago, the late Edwin A. Bischoff, of Newark, N. J., wishing to put in order his extensive local collection of Apions, sent me representatives of all species taken by him in northern New Jersey. Mr. Bischoff was a very thorough and painstaking collector who went over as with a fine tooth comb the territory in the vicinity of his home, from the salt meadows of Arlington to the Orange Mts., and it is safe to say that first and last there are not many kinds of beetles inhabiting that area that escaped his search.

I do not now remember how many species of *Apion* there were in his lot, though I believe that was shortly after announced when he brought his box of neatly arranged specimens to a meeting of the New York Entomological Society, and spoke of his success in finding these little weevils. As for myself, I was not a little surprised to find in his sending three undescribed species, all belonging to the first group of the genus, which is characterized by its simple claws and generally distinctly modified front thighs of the male. Descriptions of these three species have been drawn up for some time, and it is fitting that their publication should not be longer delayed. With them I include descriptions of two new species of *Apteromechus* from Florida and Texas. The types of these species are all contained in the writer's collection.

Apion dilaticolle n. sp.

Moderately elongate, black throughout, the base of the antennae picescent; pubescence extremely sparse and fine, surface moderately shining. Beak (♂) scarcely equal in length to the head and prothorax, dilated before the base, sparsely finely punctate and finely strigose, the extreme apex polished; in the female a little more slender, scarcely dilated at base, sculpture a little finer as usual, very little longer than in the male. Prothorax stout, subrotundate, as wide (♂) or a little wider (♀) than long; surface coarsely closely punctate, median impressed line subentire. Elytra elongate oval, about 3/5 wider than the prothorax and 3/5 longer than wide; humeri moderate, intervals flat, each with a more or less regular series of small punctures. Ventral segments rather coarsely and closely punctate.

Length 2.3 mm.; width about .9 mm.

Male.—Front thighs only feebly dilated, the swollen area completely very finely and closely striate and without evident inferior limiting ridge; middle tarsi with small terminal mucro, hind tibiae not visibly mucronate; other characters as usual in the group.

New Jersey.

I have seen a short series of this species collected by Bischoff at Montclair and Ramsey, and others taken at Oradell by Nicolay. The type is a male from Montclair.

This species must be placed next to *pennsylvanicum* by my table,[1] differing by its larger thorax, more evenly oval elytra, coarsely punctured ventral surface and close striation of the femoral swelling in the male.

Apion bischoffi n. sp.

A. atripes Fall (Trans. Am. Ent. Soc., 1898, p. 116) nec Smith (Trans. Am. Ent. Soc., 1884, p. 49).

More closely allied to the preceding species than to any other, the prothorax being almost as robust, the form and length of the beak and the general sculpture of the body being about the same. The elytra are relatively broader, and when viewed in profile the hinder body is seen to be very distinctly shorter and more convex in the present species than in the preceding. The front femora are similarly gradually swollen, the smooth area polished and with very fine less approximate striae, about eight in number, the inferior limiting ridge well developed. As in *dilaticolle* the hind tibiae are not visibly mucronate at apex.

The type of this species is a male collected by Bischoff at Montclair, New Jersey; its dimensions are: length 2 mm., width .85 mm. Other localities in the series before me are Rahway and Woodside, New Jersey; Staten Island, New York; Matthias Point and Fredericksburg, Virginia.

As indicated above, this is the species which I regarded as *atripes* Smith in my synopsis of the genus. I had not seen the Smith collection at that time, the determination being based on specimens so named in the Horn and Hubbard and Schwarz collections, which had formed a part of the material used by Smith in the preparation of his Synopsis of Apion in 1884. I have lately had the opportunity of inspecting the Smith collection and find there three specimens of *atripes,* all from Georgia. This was the first locality named by Smith for his species, and these three examples must, I suppose, be considered the types. They are not precisely alike and perhaps represent two closely allied species, but as all are females it is difficult to characterize them definitely. Certainly they are quite different from the present species, being smaller and with the normally rather small thorax of the group.

---

[1] Trans. Am. Ent. Soc., 1898, p. 111.

Apion diffractum n. sp.

> Very similar to but slightly more robust than *finitimum,* to which it is most nearly allied. Black, legs brownish piceous varying to brownish red. Beak somewhat shorter than the head and thorax in the male, with the apical third polished, basal dilatation rather strong, second joint of antennae reaching the eye. In the female the beak is as usual a little longer, more slender, scarcely dilated before the base, and more finely sculptured. Prothorax as long as or slightly longer than wide, base slightly wider than apex, sides a little prominent at middle, surface closely punctate, dorsal line fine, not entire. Elytra with moderate humeri, rather strongly inflated behind, surface shining, often with slight purplish gloss, intervals flat; pubescence nearly wanting; ventral punctuation moderately fine. In the males the front thighs have a strong though rounded tuberculiform swelling on the inner side, the inferior face of the swelling very densely finely striate; inferior limiting ridge strong; front tibiae almost as strongly but more gradually widened apically than in *finitimum.* Length 1.5 to 2 mm., width .75 to .85 mm.

The type is a male, and one of a series of specimens taken by Mr. Bischoff on the salt meadows at Arlington, New Jersey, in February and March. A single example from Montclair, N. J., and one each from Cambridge, Mass., and Coeur d'Alene, Idaho, complete the series before me. The Cambridge specimen was previously placed with *finitimum* and recorded as such in my revision of the genus.

The present species and *finitimum* differ from all our other species of Group I by the strongly widened front tibiae of the male. In both, the femoral prominence is strong, but in *finitimum* the lower surface of the swelling is more finely and less closely striate, the area being distinctly shining, while in *diffractum* it is dull from the extreme density of the striae.

Apteromechus microstictus n. sp.

Similar in general aspect to *A. ferratus,* with which it has been hitherto confused. As compared with *ferratus* the present species is a little smaller and slightly narrower. In *ferratus* elytral intervals 3–5–7 are noticeably but not conspicuously convex, and on these—more especially the third—the scales are dark brown alternating with patches of yellowish white, the latter five in number, but with the subbasal and subapical patches usually smaller and often indistinct. In *microstictus,* intervals 3–5–7 are conspicuously elevated, the spots of whitish scales are replaced by a single white scale arising from the midst of smaller condensations of dull yellow scales of the same tint as those of the noncarinate intervals, while the dark brown scales of the alternating areas are much fewer in number, being reduced to a single or an irregularly double line. The coarse very dense punctures of the pronotum are even a little coarser in *microstictus,* and show a tendency to coalesce to form oblique channels, which is scarcely the case in any examples of *ferratus* before me. Length 2.9 to 2.95 mm.; width 1.3 mm. (for *ferratus* 3.6 by 1.75 mm.).

Apteromechus texanus n. sp.

This name is proposed for a Texan form which is closely related to *microstictus,* and of which it may possibly be a variant. It agrees with *microstictus* in its distinctly carinate elytral intervals and in pronotal sculpture, but the scales of the slightly condensed patches along the elevated intervals are practically uniformly dull yellow, and the ventral punctuation is noticeably coarser and sparser. In *microstictus* there are two to three transverse rows of coarse punctures on ventral segments 3 and 4, while in *texanus* there is only a single complete transverse row with some smaller punctures forming a partial second series. On these two segments the number of punctures is sensibly twice as great in *microstictus* as in *texanus.* Length 3.2 mm., width 1.35 mm.

Brownsville, Texas. A single example only, collected by Professor Wickham.

NOTES ON A FEW HEMIPTERA FROM THE SAN BERNARDINO MOUNTAINS, CALIFORNIA.[1]

By E. P. Van Duzee, San Francisco, Calif.

On September 20, 1923, it was my privilege to go with Dr. F. R. Cole and his parents, as their guest for a week, to their summer home in Mill Creek Cañon, San Bernardino Mountains, 16 miles east of Redlands. From their cottage, at 3,800 feet elevation, we collected up to Cedar Cañon at 4,000 feet, and up Home Creek Cañon to over 5,000, near Glen Martin. The Fall rains had begun and it is quite possible that some of the insects were getting ready for hibernation on the plants on which they are now recorded. On this account I have endeavored to note every case where young were taken with the adults. The following food records are, I believe, mostly new.

Heterogaster behrensii Uhler. Found with young in great abundance on nettle at 3,800 ft.

Lygus nubilus Van D. Common on juniper trees but described from elder. Possibly wintering on the juniper as were the alder chermids, *Psyllia alni americana* Crawf.

Phytocoris formosus Van D. The food plant of this is a species of *Cordylanthus.*

Pilophorus discretus Van D. Taken in large numbers with young on wormwood. Described in 1918 from Colton and Alpine, Calif.

Hyalochloria bella Van D. On yerba santa, *Eriodictyon californicum.*

Macrotyloides apicalis Van D. On manzanita, *Arctostaphylos pringleyi,* at 5,000 ft.

Uhleriella coquilletti Van D. On sycamore trees.

Scaphoideus blandus Ball. On pine.

Phlepsius occidentalis Baker. On live oak.

Thamnotettix pasadena Ball. Numbers taken on manzanita, *Arctostaphylos pringleyi,* near Glen Martin at 4,500 feet elevation.

Eutettix subaenea Van D. Not uncommon on juniper at 4,500 feet.

---

[1] Contributions from the California Academy of Sciences, No. 232.

Neocoelidia candida Ball. On *Gutierrezia.*

Neocoelidia lineata Baker. Beaten in numbers from pine trees at 4,000 feet.

Ticida cingulata Uhler. Several beaten from *Adenostoma.* These are the true *cingulata* of Uhler and prove to be quite distinct from my *Loxophora transversa,* which must therefore be restored to specific distinction under the name *Ticida transversa* (Van D.). My species is larger and browner with more rounded thoracic lobes, different head characters, etc. It inhabits southern Utah and Arizona while *cingulata* is, perhaps, confined to California.

Timodema miracula Ball. Taken with young on yerba santa, *Eriodictyon californicum.*

Catonia cara Van D. Beaten in numbers from juniper along the trail to Glen Martin, at 4,500 feet elevation.

On the Distribution of Feralia deceptiva McD. (Lepid., Phalaenidae).—*Feralia deceptiva* McD. 1920, McDunnough, Can. Ent., LII, 162, pl. IV, f. 2, ♂ genit., *Feralia.* ♀ *columbiana* Sm. partim. (" cotype " nec type). 1903, Smith, Can. Ent., XXXV, 9, *Feralia.*

Smith's " cotype " is in the Barnes Collection and is labeled " Calgary, N. W. Ter." It apepars to be an old specimen and was probably collected at the date when this label represented much of the Canadian Northwest. A second and similar specimen with the same label is in the Barnes Collection ex Coll. Jacob Doll. The Alberta record is probably correct, but subject to question. McDunnough described the species from Vancouver. Victoria and Vancouver specimens are also in the Barnes Collection.

Mr. Engelhardt recently submitted a specimen from Mt. Rainier, Washington, which agrees well with topotypical material. This appears to be the first authentic United States record.

Wm. Barnes and F. H. Benjamin, Decatur, Illinois.

NOTE ON THE SWEET-POTATO LEAF-BEETLE AND A RELATED MEXICAN FORM.

By F. H. Chittenden, Washington, D. C.

The occurrence of *Typophorus viridicyaneus* Crotch on sweet potato, according to our records, was first mentioned by J. D. Mitchell, at Victoria, Texas, June 4, 1903. The same year G. H. Harris observed the species on wild sweet potato and on sweet potato and morning-glory or tie-vine at Calvert, Texas.

June 13, 1919, W. A. Thomas, of the Bureau of Entomology, reported injury to sweet potato in Curratuck County, N. C., where the beetles were defoliating the plants. Attack was severe, covering about 50 acres in a single field, and the grower was discouraged because of the sudden appearance and numbers of the pest. The beetles clustered in large masses about the crown of the plant and, after defoliating that, gradually spread over the entire vine. In the same fields larvae of the species did considerable damage to the roots.

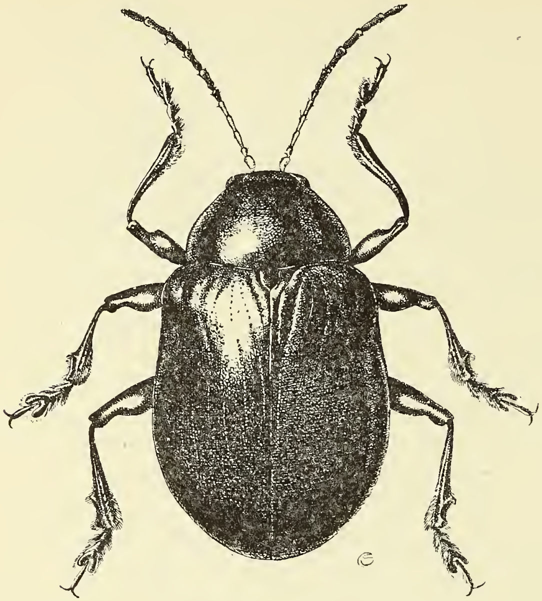
April 26, 1920, M. M. High reported that the larvae had done considerable damage to sweet potato at Kingsville, Texas, during two seasons, the grubs being more active in 1920 than the previous year. Reports also were received from all over the state where sweet potatoes were grown, and from Mississippi, where larvae occurred in injurious numbers. Mr. High wrote that it was feared that if these beetles continued to increase on sweet potato at the rate that they did the previous year, the grower would have another serious insect pest comparable to the sweet-potato weevil with which to reckon. Larvae were observed from September until December, 1919. Attack was also observed to sweet potato by the adults at Harlingen, Texas.

November 12, 1920, George C. Becker reported injury to sweet-potato roots by the larvae of this beetle at Clarksville, Ark., and furnished specimens of the work.

During July, 1924, Philip Luginbil reported the occurrence of the beetles on sweet potato at Columbia, S. C.

This species has been known for many years on wild Convolvulaceae but for some reason does not appear to have been recorded as attacking sweet potato—at least no record is available.

August 10, 1921, when in Mexico, Mr. High obtained *Typophorus sturmi* Lefèvre at Monterey, Nuevo Leon. It was found



in numbers in all sweet potato fields visited and was abundant in two fields, as many as a dozen individuals being taken from single plants. It was feeding on the leaves and stems and depositing eggs in the stalks about the base.

Compared with *T. viridicyaneus,* the elytra are more distinctly and more coarsely striatopunctate, the prothorax is usually more strongly punctate, and the antennae are more slender, especially joints 2 to 5. The lower surface, on the other hand, is less distinctly punctate, but the few scattered hairs proceeding from the scarcely visible punctures are readily seen, whereas they are apparently or nearly absent in the larger species. The size is smaller, 4.5–5.5 mm. in length, while *viridicyaneus* measures 5.5–7.5 mm. The two forms are subject to similar variation in color, from green to blue. In the northern range of *viridicyaneus,* the prevailing color is green; in the South, blue predominates and the majority of specimens of *sturmi* are distinctly blue. While these two forms are very closely related and have been called synonymous by Horn and by Champion, *sturmi* is at least a distinct form, either a subspecies or a species. Because of the close relationship of the two forms and the variability of some of the characters indicated, the Mexican form may be designated conservatively as *Typophorus viridicyaneus sturmi* Lefèvre.

SOME AQUATIC HEMIPTERA HAVING ONLY FOUR NYMPHAL STAGES.

By William E. Hoffmann, University of Minnesota, St. Paul, Minn.

During the past year while doing some rearing work in connection with the evaluation of certain aquatic environments three species of waterbugs were found to possess but four nymphal stages instead of five which is the usual number among aquatic Hemiptera. Mr. Bueno in his paper on *Microvelia borealis* Bueno, published in 1917, stated this species to have but four nymphal stages. Hungerford in rearing this species found more than this in some and it was suggested that here might exist variation or that apterous forms have fewer stages than winged. I have not reared the winged form of this species but I have secured the length of the last nymphal stage of the winged form of *M. hinei* Drake, *M. albonotata* Champion and *M. buenoi* Drake, and in each case the duration was the same as for the apterous forms of the same species. This coupled with the fact that the winged and apterous forms of a *Velia* I have reared not only have the same number of instars but have instars of equal duration, leads me to believe that both forms of *M. borealis* will be found to have the same number of nymphal stages.

I am convinced Dr. Hungerford reared *Microvelia hinei* Drake rather than *M. borealis*. Plate XII of his "The Biology and Ecology of Aquatic and Semiaquatic Hemiptera" is rather confusing in light of what he has to say on page 139. He there states he has " found more than four nymphal stages in some," referring no doubt to the winged form, yet he figured only four nymphs on his plate. His figure 8, of " last instar nymph," is a figure of the apterous form of *M. hinei*. The apterous form of this species has always had five stages in my experience. Several dozen nymphs have been reared under varying conditions of temperature (including rearings of 70° and 90° F. constant temperature) and nutrition, yet the number of instars has been constant. At the present time I have this species in rearing and hope to breed out winged forms.

So far as known to the writer *Microvelia borealis* Bueno is the only waterbug recorded as having less than five nymphal stages. I reared this species the past season obtaining the same result that Mr. Bueno recorded. The only other species of *Microvelia* that has been reared in this country is *M. americana* (Uhler). I have reared this species the past two seasons securing data not unlike that published by Bueno in 1910. In addition to this I have secured the life histories of *M. hinei* Drake, *M. albonotata* Champion and *M. buenoi* Drake, finding the first two species to have five nymphal stages and the last named but four. So of the *Microvelia* whose life cycles we know, we have three species with five nymphal stages, and two species with four nymphal stages.

The other aquatic Hemipteron found to have but four nymphal stages is *Nepa apiculata* Uhler. This is as interesting as the case of the *Microvelia*, for since the European *N. cinerea* L. is said to have five nymphal stages, we again have species within the same genus, with a different number of instars. For other genera Bueno has found *Ranatra americana* Montandon to have five nymphal stages while the speaker has found the same to hold for two other species of *Ranatra* including one undescribed species. Both Mrs. Grace Wiley and myself have reared an undescribed species of *Curicta* which possesses five nymphal stages.

LIFE HISTORY RESULTS.

	egg stage	first instar	second instar	third instar	fourth instar	total nymphal period	sex	date
M.	days	days	days	days	days	days		
borealis ..	18	8	5	5	9	27	♀	Nov. 6
	18	7	6	3	6	22	♀	Oct. 24
	18	7	5	5	8	25	♂	Oct. 31
M. buenoi	12	7	7	7	6	27	♀	Oct. 28
	12	8	6	6	7	27	♀	Oct. 30
	12	7	6	5	8	26	♀	Nov. 1
	12	8	6	9	14	37	♀	Nov. 16
	10	10	6	7	8	31	♂	Oct. 10
N.	16	9	9	13	23	54	♀	Sep. 28
apiculata .	16	8	11	12	24	55	♀	Sep. 28
	9½	10	9	14	18	51	♂	Oct. 14

It may be observed from the above results that the nymphal life averaged 24 2/3 days for three specimens of *Microvelia borealis* Bueno, 29 3/5 days for five specimens of *Microvelia buenoi* Drake, and 53 1/3 days for three specimens of *Nepa apiculata* Uhler. Additional data from incomplete life histories might have been used in securing the average length of the several instars, but inasmuch as temperature plays such an important rôle in the development of these forms, the rate of development at unknown temperatures is not extremely valuable. Rearings under controlled temperatures are now in progress and will be reported on at a later date.

ON THE SYNONYMY OF CERAPODA OBLITA WITH NOTES ON THE TYPE OF "AGROTIS" INSERTANS. (Lepid., Phalaenidae.)

By Wm. Barnes and F. H. Benjamin, Decatur, Ill.

Cerapoda oblita Grt.

1877, Grote, Bull. U. S. Geol. Surv. Terr., III, 117, *Oncocnemis.*
1893, Smith, Bull. U. S. N. M., XLIV, 162, *Oncocnemis.*
1906, Hampson, Cat. Lep. Phal. B. M., VI, 181, text fig. 50, *Cerapoda.*
1913, Barnes & McDunnough, Contr. N. H. Lep. N. A., II (1), 12, pl. V. ff. 3–4, *Cerapoda* (*Oncocnemis*).
1922, Barnes & Lindsey, Ent. News, XXXIII, 9, *Cerapoda.*

insertans Sm.

1890, Smith, Trans. Am. Ent. Soc., XVII, 45, *Agrotis.*
1890, Smith, Bull. U. S. N. M., XXXVIII, 136, 139, *Carneades.*
1893, Smith, Bull. U. S. N. M., XLIV, 89, *Carneades.*
1903, Dyar, Bull. U. S. N. M., LII, 140, No. 1576, *Paragrotis.*
1903, Hampson, Cat. Lep. Phal. B. M., IV, 206, pl. LXIX, f. 10 (type), ignot., *Euxoa* (*Euxoa*).
1917, Barnes & McDunnough, Check List, p. 44, No. 1393, *Rhizagrotis.*
1922, Barnes & Lindsey, Ent. News, XXXIII, 10, *oblita, Cerapoda.*

‡ *strigata* Auct. nec Sm.

1903, Holland, Moth Book, p. 170, pl. XX, f. 17, *Calophasia.*

deserta Grin.

1912, Grinnell, Bull. S. Calif. Acad. Sci., XI, 79, *Autographa.*
1917, McDunnough, Ent. News, XXVIII, 233, *oblita, Cerapoda.*

A specimen compared with the type of *oblita,* British Museum, and a type of *deserta* are in the Barnes Collection. Smith described *insertans* from the Neumoegen Collection, single ♂, Spencer's Bridge (1890), and in 1893 stated the type was in that collection. Accordingly, we wrote to Mr. G. P. Engelhardt and he submitted to us a specimen labeled "Brit. Columbia Spencer Bridge 25/8", "Typicum Specimen", "Col. B. Neumoegen", "13281", "*Agrotis insertans* Smith Type"; the last label we believe in the handwriting of J. B. Smith. This specimen is very badly rubbed and in some regards does not fit the original description, the hind wing having fuscous along the outer margin and on the veins. It appears to be the specimen which supplied Hampson's figure (1903) although that figure is scarcely recognizable, the artist evidently using his imagination where the specimen was too poor to see details. Thus, unless labels had become shifted sometime between 1890 and 1902 this specimen is the type. Smith being notoriously careless in his descriptions, and with no proof to the contrary, we propose to consider the specimen labeled type to be the true type. It is a *Cerapoda* and although badly rubbed, is, in our estimation, nothing but *oblita.*

HERMAN H. BREHM.

Herman H. Brehm died September 30, 1924, at his home in South Amboy, N. J., following an illness of two years, at the age of fifty-five.

Born in Newark, N. J., July 24, 1869, he became interested in entomology when a boy of 16. For fifteen years from its inception he held the position of supervisor to the mosquito exterminating work under Dr. John B. Smith, then State Entomologist of New Jersey. While still in the service of the state, he moved from Newark to establish himself in his own home in South Amboy where he conducted the New Jersey Entomological Company, dealing in insect specimens and supplies. His demise no doubt will be felt near and far, as he kept in touch with entomologists all over the country. He enjoyed the good will of the Newark Entomological Society, of which he was a member of long standing up to the time of his death.

Charles Rummel, *Treasurer,*
Newark Entomological Society.

A NEW BORBORID FROM MARYLAND (DIPTERA, BORBORIDAE).

By J. R. Malloch, Washington, D. C.

Leptocera winnemana sp. n.

Male and female: Black, shining. Orbits, frontal triangle, and along the lines of interfrontal setulae shining, remainder of frons opaque; antennae fuscous, arista paler, with pale hairs; sides and upper part of face glossy. Median longitudinal pleural suture yellowish. Abdomen brownish on sides in female. Legs pitchy colored, tibiae paler, tarsi yellowish. Wings grayish, thick veins brownish. Halteres black.

Head similar to that of *bromeliarum* K. & M.; arista distinctly pubescent, longer than width of head at vertex; antennae directed laterad; genal bristle distinct. Thorax with one humeral, one notopleural, and one pair of prescutellar dorsocentrals distinguishable from the numerous comparatively long dorsal setulae; scutellum with four marginal bristles; pleura bare except for one or two minute setulae on upper part of sternopleura. Mid tibia with two short setulae dorsally, and one or two longer preapical dorsal setulae. Hind tarsus in male with basal three segments normal, the basal one thickest and shorter than second, the fourth segment produced into a process which is directed upward and towards the apex of tarsus, the tip being furnished with long hairs which accentuate the elongation, fifth segment much elongated, over one third of the length of entire tarsus, with a curved process at its base above similar to but shorter than that on fourth segment; hind tarsus in female normal, basal segment thicker and shorter than second. Wing as in *bromeliarum.*

Length, .5 mm.

Type, male, allotype, and 9 paratypes, reared from fungus that was uncovered on turning over a stone lying on the ground, Plummer Island, Md., Aug. 27, 1922 (J. R. Malloch).

This species is extremely like *bromeliarum* K. & M., but averages smaller, and the hind tarsus in male of *bromeliarum* is normal in structure.

Spuler has recently erected the subgenus *Bromeloecia* with *bromeliarum* as genotype. In view of the fact that *winnemana* feeds in the larval stages in decaying fungi it appears probable that even the genotype may not be restricted to the bromeliad habitat.

EDITORIAL.

On a Universal Language.

English research chemists are at present much concerned about the important question of a chemical universal language. This is no less vital from the standpoint of the working biologist and therefore it merits our careful thought.

Biologists are peculiarly the victims of the confusion of tongues. Not many years ago, a working knowledge of German, French, and Latin in addition to English was all one needed; in fact, Latin was the key to taxonomy. To-day we are confronted with the necessity of adding to our original language equipment not alone the Latin languages—Spanish, Italian, Rumanian—but we must also add the Slavonic and Turanian tongues, such as Russian, Magyar, Japanese, and even Chinese, which not only differ radically in their structure from the western European languages, but also have alphabets of their own, of strange forms.

Esperanto, or some other composite artificial universal language, is often suggested, but it has its weaknesses, naturally. In such a language, a complete new terminology would have to be adopted, or the old one remade to fit into its rules. Of course, living tongues are always found to have opponents.

Chemistry and Industry makes the sane suggestion that much friction might be avoided by adopting Latin as the universal language. This suggestion has great merit. Not alone is English in a great measure akin to Latin, but one great European language group is its lineal, if attenuated, descendant. Further, all technical terminology in the natural sciences in most languages is of Latin origin, or Latinized in form. And particularly and specifically, in biology all the early fundamental works are in Latin; and many modern descriptions and keys are also in that language. It should be possible to modernize the language by suppressing case-endings in nouns and by simplifying and reducing verbal forms; by using prepositions simply, as in English, or Spanish, to indicate possessives and adjectival and adverbial phrases; and by indicating cases by position of nouns. This would tend to make it a simpler and more direct language; and especially and particularly, to divorce Latin from the classic stamp that so obsesses some entomologists. In some such form, Latin, without introducing invidious comparisons, could easily become the much wanted universal scientific language.—J. R. T. B.

BOOK NOTE.

Galapagos: World's End. By William Beebe. [G. P. Putnam's Sons, New York, 1924. $9.]

Dr. Beebe has succeeded in producing a series of word-pictures of an enchanted land, peopled by as queer an assemblage of life in its way as Australia. While doing this he has not departed from scientific accuracy, but nevertheless his racy narrative, with those of his co-authors, moves rapidly from vivid scene to scene. It is a fine story of exploration as such and its varied chapters make it easy to read at almost any part without loss of continuity.

From the day the yacht Noma sails from New York until its return, adventures of all sorts are the daily food of Dr. Beebe and his associates. And we in comfort can enjoy these lively moments.

It is a compendium and running reference of all that is known of Las Islas Encantadas from the day the wandering Spanish Conquerors first saw their peaks until they vanish from the sight of the Noma and its passengers.

Scientifically, it is a gloss and extension of Darwin and Wallace, a source of coordinated knowledge of the natural phenomena of these remnants of a drowned continent. It is a distinguished contribution to our knowledge of island life and the origin of species.

Entomologically speaking, there is a little that is new but much that is of interest. Of course, some unknown species, to be described elsewhere, are mentioned and figured. A most gaily colored *Halobates* in scarlet and blue has drawn our eye. It is the most colorful of all the waterstriders in life. We are sorry not to have been there to observe it and get additional data on the life history of these dwellers of the high seas.

Our censorious eye lights on one or two slight matters. It is not CO_2 which gives eggs that reminiscent atmosphere when beyond their youthful heyday; it is H_2S, a near neighbor of the highly scented CS_2. Another is to us an added incentive to engage as Spanish editorial specialist. Why *Gonsalvo* Pizarro? It is Gonzalo. And other minor lapses painful to our Latin soul are noted here and there.

It is a fine book. Read it and enjoy it. J. R. T. B.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

ARKANSAS INSECTS.—Am again collecting. Have Lepidoptera on hand. Miss Louise Knobel, Hope, Ark.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 81 Robert St., Toronto, Ont., Canada.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

WANTED.—Odd numbers of the first volume of this Bulletin. J. R. de la Torre-Bueno, 11 North Broadway, White Plains, N. Y.

WANTED.—Vols. I, II and III, this Bulletin. N. Y. Public Library, 5th Ave. and 42d St., New York, N. Y.

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages 1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII

Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

FOR INDIAN BUTTERFLIES

Write to

S. H. KARAI, Zohra Mansion, Wadia Street
TARDEO, BOMBAY, INDIA

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

SMITHSONIAN INSTITUTION
AUG 10 1925
NATIONAL MUSEUM

XX JUNE, 1925 No. 3

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed August 14, 1925

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1925

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Vice-President
J. R. DE LA TORRE-BUENO

Librarian
ELMER McDEVITT

Recording Secretary
E. L. BELL

Curator
A. C. WEEKS

Corresponding Secretary
HOWARD NOTMAN

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

AN OUTLINE OF THE ECOLOGY OF THE GYRINIDAE, Hatch 101
A NEW HYDROMETRID GENUS FROM HONDURAS, Hussey 115
THE AILANTHUS SILKWORM, Farmiloe 120
NOTE ON LIXUS FIMBRIOLATUS, Chittenden 123
APTEROMECHUS MICROSTICTUS, Fall 123
NOTES ON N. Y. THYSANOPTERA, WITH DESCRIPTION OF NEW GENERA AND SPECIES—I, Hood 124
CORRECTION TO AQUATIC HEMIPTERA WITH FOUR NYMPHAL STAGES 130
COLLECTING MICROVELIA IN HAWAII, Hoffmann 132
EUMENES DYSCHERUS, A NEOTROPICAL NOT AN AFRICAN WASP, AND OTHER NOTES ON SYNONYMY, Bequaert 134
A STUDY OF THE INTERRUPTA–HARRISII GROUP OF THE GENUS ARCTOCORIXA, WITH DESCRIPTIONS OF NEW SPECIES, Hungerford 141
CALIFORNIA BUTTERFLY NOTES—III, Coolidge 146
PODOPS CINCTIPES AND SOLUBEA PUGNAX, Davis 147
BEHAVIOR OF LEPTOGLOSSUS OPPOSITUS, Chittenden 148
MELIGETHES AENEUS IN THE U. S., Chittenden 149
BOOK NOTES: FAUNA OF NEW ENGLAND—DIPTERA; ENCYLOPEDIE ENTOMOLOGIQUE—II, DIPTERA, Bequaert 150

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XX June, 1925 No. 3

AN OUTLINE OF THE ECOLOGY OF GYRINIDAE.

By Melville H. Hatch,[1] University of Michigan, Ann Arbor, Mich.

I. Adaptations.

General aquatic adaptations: The adaptations to an aquatic environment to be found in the Gyrinidae are much the same as those described by Sharp (1882) and Needham and Williamson (1907, p. 482–485) for the Dytiscidae, to which they are probably genetically related. These are (1) a stream line form offering a minimum of resistance to the water, (2) increased rigidity, and (3) natatorial legs.

The first is manifested in the continuous outline of the head, prothorax, and elytra, by the depression of the eyes, the absence of pubescence and sculpture, and the depression of parts of the venter. When not in use, the legs are received in more or less pronounced grooves.

Increased rigidity is brought about in part by an anterio-posterior compression and the overlapping of parts, effected by the deep immersion of the head in the prothorax and by the coadaptation of prothorax and mesothorax. The prothorax overlaps the mesothorax except in the midventral region where the anterior lobe of the mesosternum protrudes between the procoxae, which are themselves received in hollows on the anterior aspect of the mesosternum. The mesofurcae protrude caudad through the anterior foramen of the mesothorax, where they serve as points of attachment for muscles and add to the general rigidity.

---

[1] A contribution from the Zoological Laboratory of the University of Michigan.

The mechanism involved in locking the elytra must be considered a general coleopterous structure rather than a special gyrinid or even a special aquatic adaptation. It provides a definite air space between the elytra and the dorsum of the abdomen in immediate contact with the abdominal spiracles. The metaspiracles are situated on the metacoria between the metaepisternum and the mesoepimeron and are in a position to draw their air supply from the same source.

The meso- and metapods are both adapted for swimming, apparently acting as powerful paddles. They represent a much higher degree of aquatic adaptation than do the legs of any other aquatic Coleoptera. Due to the fact that the mesopods as well as the metapods are natatorial, both meso- and metacoxae are solidly and deeply set in the venter of the body, and, with the meso- and metasternum, are well developed for containing the powerful muscles that operate the legs, a considerable advance over *Dytiscus.* The propods function (1) as ambulatory appendages on land, (2) as prehensile appendages, (3) as clasping appendages for the male during copulation, and (4) (Sharp, 1869, p. 53) as steering organs. Wesenberg-Lund (1915, p. 304) suggests that the genital lobes may be extruded and serve as rudders.

Adaptations to surface film: In addition to their general aquatic adaptations which they have to an extent in common with the Dytiscidae, the Gyrinidae have a series of features that adapt them to conditions on the surface of the water.

Dineutus floats in the water like a boat rather than rests on it like a water-strider. Due to an air store the body of the beetle is lighter than water, so that, when the animal is submerged, it must cling to something in order to maintain a position at rest beneath the surface. Likewise, when swimming under water, the beetle must move forward with its anterior end slightly bent down. When the beetles were placed on the surface of the water in a plane sided glass aquarium and the water was illuminated by a single source of light arranged so that the beam of light passed through the wall of the aquarium below the surface of the water, the ventral surface of the gyrinids was distinctly visible, air bubbles were seen clinging to it, and an image of the venter was clearly reflected by the surface film. When the angle of incidence of a beam of light passing from water into air exceeds 48° 35′ none of the light passes through the surface film but is reflected in total. If the lower surface of the beetle had been covered by an air film, it would have appeared with the same silvery sheen when viewed from below as did the few bubbles of air left clinging to the ventral surface. Moreover, unless the surface film was actually broken by the venter, it would not have been reflected in the film.

The surface film is of some assistance in keeping the animal afloat. As the beetle rests on it, it appears to be depressed slightly on all sides, offering a measure of support to the body. The importance of this support was demonstrated by the difficulty that the animal experienced in keeping afloat when the surface tension of the water was reduced by the introduction of a few drops of liquid soap. Especially in the region of the head the water line rose considerably. The beetles recovered their equilibrium when they were taken out of the water into which the soap had been introduced, allowed to dry, and returned to normal conditions.

The water line is normally maintained along the lateral margins of the elytra and epinotum and, on the head, along the supraocular ridge, the bristles that fringe the auricular lobe of the antennal pedicel, the lateral margin of the postclypeus, and the lateral and anterior margins of the labrum. The lower eye is completely submerged, but appeared to be covered with a film of air that would limit but not eliminate the eye as an organ of vision beneath the surface.

The ommatidia of the compound eye are of such a structure as to be stimulated primarily if not entirely by rays of light striking the eye at very close to a right angle to its general surface (Folsom, 1922, p. 98). Such rays of light are least likely to be interfered with by an air film over the surface of the eye, for a ray of light striking a surface film at right angles passes through with no deflection and a minimum of reflection. Rays of light striking the eye obliquely and hence entirely reflected or refracted by the surface film are the very ones that, even though they impinged upon the eye unmodified, would stimulate it little or not at all. The presence of the surface film does reduce, at least theoretically, the amount of light reaching the individual facets of the eye and, hence, the eye as a whole. In fact it limits by nearly one half (41.25/90 or 45.8 1/3 per cent.) the amount of light other than that reaching the surface of the facet at exactly right angles to it. This follows from the circumstance that the angle of refraction increases twice as fast as the angle of incidence. The inferior eye has a considerably greater area than the dorsal eye and thus in a measure compensates for the possible decrease in the amount of light received. Miall's fear (1895, p. 34) about the uselessness of the ventral eye is quieted; Sharp's (1869, p. 521) suspicion is confirmed.

The water line extends ventrad to the club of the antenna so that, when swimming on the surface, the club is held in the air. The fringe of hairs on the margin of the auricular lobe of the antennal pedicel serves to maintain the water line at this point and to prevent it from infringing upon the club. The antennae of *Dineutus* that were scrutinized while their owners were submerged were seen to be fully expanded, with a bubble of air surrounding the basal part of the club. This bubble was probably held in place by the auricular lobe and the fringe of hairs bordering it. It was impossible to determine the presence of an air film covering the apex of the club that projected beyond the bubble. Perhaps it is unwettable, so that immediately upon reemerging it is entirely dry. There is no evidence that the auricular lobe closes over the club (*cf.* Miall, 1895, p. 34).

The observations made on *Dineutus* were in part repeated and in no instance refuted on *Gyrinus*. There is reason to believe that these relationships are applicable to the family as a whole.

II. HABITAT.

Imago: The habitat of adult Gyrinidae is the surface of fresh standing water and streams never very far from shore or aquatic vegetation of some sort. In the absence of data concerning the exotic species, it is impossible to make any certain generalizations. I suspect that the primitive habitat was the surface of standing water, and should ascribe to this habitat the generality of species of *Enhydrus, Dineutus, Androgyrus, Macrogyrus, Aulonogyrus,* and *Gyrinus.* Most of the Orectochilini appear to be stream inhabitants, and among the Enhydrini *Porrhorrhynchus* and certain *Dineutus.*

(1) Quiet water habitat. Gyrinids do not go many feet from vegetation. I have found *Dineutus americanus* L., *nigrior* Rbts., and *hornii* Rbts. on ponds and lakes in Michigan, and the same habitat is reported for *americanus* L. (Wilson, 1923, p. 306), *emarginatus* Say (Blatchley, 1910, p. 241), *metallicus* Aubé (Ochs, 1924, p. 5). Nowrojee (1912, p. 177) records *D. unidentatus* Aubé in India from the river during hot weather and from ponds and pits filled in by rain during the monsoons. Mr. F. M. Gaige found *D. truncatus* Sharp and *Gyrinus parcus* Say on the surface of a series of heavily shaded pools in the bed of a dry stream in Panama. Nowrojee's record suggests the possibility that *truncatus* is a river inhabitant during the wet season.

The species of *Gyrinus* seem to be more ubiquitous than *Dineutus.* They live on ponds and lakes, but likewise they do not hesitate to frequent the water of ditches, bog pools, swamps, and small protected coves along the margins of slowly flowing streams, and they have been seen swimming on a side-walk puddle or in a horse trough. *G. marinus* Gyll. of Europe inhabits "sussem u. Brakwasser" (Schaufuss, 1916, p. 143). Wilson (1923, p. 309) claims that *Gyrinus* prefers gently running water and his figure (1923, p. 5) shows a swarm of them on the downriver side of a boat wharf, but in a position protected from the current. I am inclined to doubt whether *Gyrinus* ever lives in the current. I have seen numerous swarms along the margin of streams, but they have always been in little coves where the current was imperceptible, and I suspect that this is the interpretation to be placed upon Wilson's record. Fall (1901, p. 55) says that in California *G. plicifer* occurs in small streams while *consobrinus* prefers larger and more permanent waters, but adds nothing more.

(2) Stream habitat. *Dineutus discolor* Aubé is the only stream gyrinid that has come under the direct observation of the author. This species apparently inhabits only the open flowing water of slowly moving streams or the slowly flowing portions of swifter streams (Blatchley, 1910, p. 241; T. H. Hubbell; J. W. Angell). The beetles swim in the current and are often gregarious. They head upstream and swim in a series of jerks only just fast enough to maintain a position that is fixed relative to the shore line. Individual beetles occasionally come nearer shore where the current is less swift, and here they swim about in the irregular fashion of their quiet water relatives. When alarmed, they dart off a meter or so down stream and then dive and cling to submerged objects. In the course of a few moments they have begun to reassemble in the same spot. At one place, about 14 meters below the situation occupied by the *D. discolor* and in a typical pond situation which was in direct communication with the stream occurred *D. nigrior* and *D. hornii,* but no *D. discolor,* showing the completely different habitat preference of the two groups of species. When specimens of *D. discolor* were brought into the laboratory they seemed to thrive as well on the standing water of the aquarium as did the quiet water species. Since writing the above, I have found *D. productus* Rbts., heretofore known only from Texas and Louisiana, in the current of the Sangamon River, at Decatur, Ill.

The stream habitat is indicated in the literature for the following: *Dineutus serrulatus* Lec. (Blatchley, 1919, p. 316; Dozier, 1920, p. 362), *D. longimanus portoricensis* Ochs (Ochs, 1924, p. 6), *D. vittatus* (Germ.) (W. J. Clench, J. W. Angell), *D. robertsi* Leng (Leng, 1911, p. 11), possibly *D. truncatus* Sharp (F. M. Gaige) and *D. unidentatus* Aubé (Nowrojee, *ibid.*), *Porrhorrhynchus* (Régimbart, 1902, p. 5; 1907, p. 153), Orectochilini (Sharp, 1868, p. 59–60, 1882, p. 50–51; Kolbe, 1880, p. 228; Régimbart, 1884, p. 382–384, 1902, p. 8–10; Reitter, 1908, p. 237; Schaufuss, 1916, p. 141–143; de Kerherve, 1922, p. 36; Nowrojee, 1912, p. 180; Leconte, 1868, p. 373; though the lake habitat is indicated at times for *Orectochilus villosus* O. Mull.) Wesenberg-Lund, 1913, p. 239; Sharp, 1868, p. 59–60). If body form is any indication of habitat, *Dineutus angustus* Lec. is a stream species. There is some evidence that the habitats of *Orectochilus villosus* and *Gyrinus natator* are mutually exclusive, the one on running water, the other on quiet water (de Kerherve, 1922, p. 36).

Larvae: The larvae are gill-breathers and independent of the surface, so are able to escape the limitations to which dytiscid larvae are subject. In Third Sister Lake, a small lake near Ann Arbor, Michigan, inhabited by immense numbers of *Gyrinus* and *Dineutus nigrior* and *hornii,* nearly fully grown *Dineutus* larvae were found in beds of completely submerged vegetation (water grass and elodea). There were from one to three or four feet of open water between the top of the elodea and the surface of the lake. No other beetle larvae and no air breathing insects, larvae or adults were found, with the exception of numerous specimens of the minute dytiscid, *Bidessus flavicollis* (Lec.). Gill breathing insects (Odonata, Trichoptera, Neuroptera) were abundant. Nowrojee (1912, p. 178) found *D. unidentatus* larvae in submerged vegetation likewise. Two younger *Dineutus* larvae were found in Third Sister Lake in somewhat shallower water (12 to 18 inches) nearer the emergent vegetation where eggs had been found, and it is possible that there is a migration of the growing larvae from shallower into deeper water.

Wesenberg-Lund (1913, p. 239; 1915, p. 305) finds *Orectochilus villosus* in lakes. He suggests that the larvae live on the stalks and leaves of the *Potamogeton* in the same locality, often in several meters of water, a situation that resembles that of *Dineutus.* No definite information is at hand concerning *Gyrinus* (*ibid.*).

III. Life History.

In the Gyrinidae the larvae and adults occupy different ecological situations. The larval period is entirely a time of feeding and growth. The adult must reproduce and this involves seeking out the opposite sex, copulation, and oviposition. Probably, too, the adult must feed before laying eggs. The distribution of the species devolves largely upon the adult.

Habits: When undisturbed *Dineutus* and *Gyrinus* gather together in immense schools and either rest or swim slowly over the surface of the water. They are gregarious to a marked degree, though scattered individuals are always to be encountered. The rapid gyrating motion is not their normal means of progression, but is a reaction to an unusual stimulus in the nature of a reflex. The stimulus may be visual, as the movement of a person on the bank, or tactual, as the agitation of the water or contact with an unfamiliar object. Dalgliesh (1912, p. 65) calculated that *Gyrinus* swims about seven hundred and twenty times its own length in a minute. I computed that *Dineutus discolor* swims well over a thousand times its own length in a minute. When alarmed the members of a swarm scatter in all directions. As one approaches a school of *Gyrinus* in a boat the stragglers around the edge of the swarm become aware of the presence of the unusual object and are the first to become disturbed. They dash off in every direction. Those that go towards the rest of the school collide with some of their fellows, which serves to communicate the alarm to them. These immediately collide with others, and these with others, until, in the course of a few seconds, the whole mass is in a condition of panic and is scattering in every direction. The individuals, when alarmed, swim only a few feet, then dive and cling for a few moments to some submerged object, when they begin coming to the surface and reassembling again in the place from which they were driven only a few minutes before.

Wilson (1923, p. 306) notes the habit of *Dineutus* and *Gyrinus* to seek shady places, especially on bright days, and I have observed the same thing. It is especially pronounced in *Gyrinus*, and I have observed a swarm of these carefully congregated in the shade at the same time that the *Dineutus* were swimming freely all over the surface of the small lake. Particularly does a school of *Gyrinus* delight to assemble under some overhanging branch or disport itself in the midst of a partly submerged bush.

In Michigan scattered individuals of *Gyrinus* are frequently observed in a swarm of *Dineutus* as well as a mixture of *D. nigrior* and *D. hornii* in the same school. Several species of *Gyrinus* frequently occur together in the same swarm (Fall, 1922, p. 270–272; Sharp, 1868, p. 54), though this is not invariable (Lake Superior, Leconte, 1868, p. 373; Frankfurt am Main, Georg Ochs).

The adults drown easily. It was necessary to bring specimens into the laboratory in paper bags or other containers that did not accumulate water at the bottom. Specimens have been kept as long as seven hours in this way without mortality, though after twenty-four hours all the *Dineutus* and over half of the *Gyrinus* were dead.

The beetles fly readily (Osborn, 1886, p. 63; Miall, 1895, p. 32, 162; Wilson, *ibid.*; Fall, 1901, p. 55), and can detect the presence of water at a distance (Weiss, 1914, p. 33–34; Turner, 1924, p. 50–52). Miall (1895, p. 33) notes the odor secreted by the beetles, but this does not seem to protect them entirely against the attack of fish (Wilson, 1923, p. 252–259).

The late appearance of the adults in the fall and their early appearance in numbers in the spring makes it probable that they hibernate as imagoes in the temperate portions of their range (*cf.* Wesenberg-Lund, 1913, p. 239, who remarks that there is a little evidence that *Gyrinus* may hibernate as larvae likewise).

Food: The food is animal matter that has fallen on the surface of the water (Miall, *ibid.*; Wilson, *ibid.*), though Miall found that captive *Gyrinus* could never be induced to eat dead flies, but ate water plants. I have myself induced captive *Dineutus* to feed on dead flies and on bits of raw beef that were made to float by spearing them on toothpicks. Never would they feed unless the meat was at the surface.

Copulation: During copulation the male assumes a position on the back of the female sufficiently caudad to enable him to curve the tip of his abdomen, containing the aedeagus, downward and forward so as to establish contact with the tip of her abdomen, containing the female genitalia. As long as the male retains his position, the burden of locomotion falls on the female. Sharp (1914, p. 130) believes that the lateral lobes of the aedeagus do not enter the female during copula. There is evidence that the sperm is passed to the female in a spermatophore (Régimbart, 1884, p. 383–384; Sharp, *ibid.*).

Gyrinus (Schiödte, 1841, p. 556, quoted by Wesenberg-Lund, 1913, p. 238) and *Dineutus* copulate on the surface of the water, the males of *Gyrinus* (*ibid.*) often remaining on the females for an entire day. In *Dineutus* (*hornii* and *nigrior* in the daytime in June) the male mounts on the back of the female so that the anterior margin of his head is about a millimeter posterior to the anterior margin of his mate's elytra. With his prothoracic legs he grasps the wing covers of his mate very nearly in the region of the humeri. His mesopods and metapods are not used. The female continues to swim around much as usual, though the actual moment of copula was not observed. A slight stimulus suffices to cause the male to loose his hold. Females laid fertilized eggs as long as three days after separation from the males. *Orectochilus villosus* (Régimbart, *ibid.*) comes to shore for the actual act of copula.

Oviposition: The eggs are laid on submerged vegetation or submerged portions of emergent vegetation (*Dineutus:* Wilson, 1923, p. 302; *Gyrinus:* Schiödte, *ibid.*; Wesenberg-Lund, 1913, p. 238–239). I found the eggs of *Dineutus* (*nigrior* or *hornii*) in June and July laid end to end on the stems of emergent vegetation a few inches below the surface of the water. In captivity during the same months eggs of both *Dineutus* (*nigrior, hornii, discolor*) and *Gyrinus* were laid on aquarium plants and on the sides of the container both above and below the water line. Those laid in the air desiccated. When females were brought from the field and placed in aquaria most of them laid eggs within the first twelve or eighteen hours. From twenty to fifty eggs were usually laid by a single *Dineutus*.

The incubation periods are as follows: *Dineutus americanus* (Wilson, *ibid.*): 5–6 days; *D. hornii:* 9–15 days: *D. nigrior:* 11–15 days; *D. discolor:* 16–17 days; *Gyrinus* (Wesenberg-Lund, 1913, p. 239): 14 days; *Gyrinus:* 10–12 days.

Larvae: Gyrinid larvae are distinguished from other coleopterous larvae by their two tarsal claws (in common with other Adephaga, MacGillivray, 1903, p. 289), and the presence of a pair of slender lateral filaments, said to be tracheal gills, on each of the first eight abdominal segments and two pairs on the last segment, one of which Fowler (1912, p. 66) says may be regarded as cerci.

Young *Dineutus* larvae feed by sucking, though Wesenberg-Lund (1915, p. 304) reports that this is not the case with *Gyrinus*. It was my practice to feed the larvae with small tubificid worms, and frequently I found remains of worms from which all internal parts were missing, leaving only the transparent cuticula. In a similar fashion the young larvae would attack and suck their fellows. Wilson (1923, p. 250–251) records an instance where large numbers of partly grown *Dineutus* larvae were seen attacking young catfish. Newly hatched *Dineutus* larvae run about like caterpillars over the leaves of the aquarium plants. They hold their mandibles wide open to snap hold of anything that came their way. They were cannibalistic to a marked degree, and were apparently alert to their danger, for, when two would approach each other, one would snap at the other, or they would engage in mutual snapping, and then avoid each other quickly and move apart. First instar larvae are practically helpless if caught in the surface film.

The following table to larvae is based on published descriptions and figures. It is obviously tentative, and the characters are probably of much wider application than indicated.

TABLE TO KNOWN GYRINID LARVAE.

(Kuhnt, 1913, p. 1078–1079; Wesenberg-Lund, 1915, p. 305; Wilson, 1923, p. 268.)

A. Clypeus toothed.
  B. Clypeus with three teeth; mandibles without teeth on inner margin .... *Dineutus.*
    C. First two pairs of lateral filaments not plumose in mature larvae; mature larva 25–30 mm. long (Wilson, 1923, p. 303, fig. 84).
      D. (*Cyclinus*) *americanus* L.
    CC. Mature larva apparently with all lateral filaments plumose; 13 mm. long (Nowrojee, 1912, p. 177, pl. xxvi, fig. 5).
      D. (*Cyclous*) *unidentatus* Aube.
  BB. Clypeus with two or four teeth; lateral filaments all plumose; mandibles with teeth on inner margin.
    Gyrinini.
    D. Clypeus with four teeth; lateral filaments on penultimate segment longer than the others (Kuhnt, 1913, p. 1074, fig. 36; Reitter, 1908, pl. 40, fig. 5a).
      Aulonogyrus striatus Ol.
    DD. Clypeus with two teeth; lateral filaments of equal length (Miall, 1895, p. 37, fig. 2).
      Gyrinus marinus Gyll.
AA. Clypeus without teeth; lateral filaments of equal length, shorter, broader, and more thickly plumose than *Gyrinus*

(Régimbart, 1882, pl. II, fig. 21; Kuhnt, 1913, p. 1074, fig. 35. Kuhnt's figure, probably through error, shows only nine pair of lateral filaments).

Orectochilus villosus O. Mull.

Pupation: The larvae come to shore to build their pupal cases whence they emerge in a few days. (*Dineutus:* Nowrojee, 1912, p. 178; Wilson, 1923, p. 305–306; *Orectochilus:* Fowler, 1912, p. 66; Lesne, 1902, p. 85–86; *Gyrinus:* Wesenberg-Lund, p. 305; *cf.* Leprieur, 1881, p. LVIII.)

Acknowledgments: The author makes acknowledgment to Professor Paul S. Welch under whose direction this study was made. Further acknowledgment is due Mr. Frederick M. Gaige, of the University of Michigan Museum of Zoology, who has placed at the author's disposal the museum's records and collections pertaining to Gyrinidae; Herr George Ochs, Mr. T. H. Hubbell, Mr. John W. Angell, and Mr. William J. Clench for notes, Professor Charles Branch Wilson for suggestions derived from that investigator's own experience with gyrinids, Professor Peter Okkelberg for help with certain Danish literature, Mr. Carl R. Brown for help and suggestions in connection with the portion on adaptations to the surface film.

SUMMARY.

1. The Gyrinid imagoes have the general aquatic adaptations of dytiscids, and, in addition, possess these peculiar features that are probably correlated with their existence at the surface of the water: (1) laterally compressed legs, the meso- and metapods natatorial, (2) a divided eye, (3) an auricular antennal pedicel.

2. The habitat of the imagoes is the surface of fresh water, either standing or slowly flowing, and never very far from vegetation. They are gregarious. The gyrating movements are a fright reaction, since, normally, they swim quite slowly.

3. Copulation takes place on the water (*Dineutus, Gyrinus*) or on shore (*Orectochilus*). Eggs are laid on plants under water.

5. The larvae are predaceous, and their habitat seems to be submerged vegetation, not far from shore, where they go to pupate, but independent of the surface.

BIBLIOGRAPHY.

Blatchley, W. S.—1910. Coleoptera of Indiana. Indianapolis, pp. 236–242.

—— 1919. Insects of Florida, Va. Supplementary notes on the water beetles. Bull. Am. Mus. Nat. Hist. 41: 305–322 (art. IV).

Dalgliesh, G.—1912. Notes on the whirligig beetle (*Gyrinus natator*). Zool. (4), 16: 64–71, 1 fig.

Dozier, H. L.—1920. An ecological study of hammock and piney woods insects in Florida. Ann. Ent. Soc. Am. 13: 325–380, figs. 1–22.

Fall, H. C.—1910. List of the Coleoptera of Southern California with notes on habits and distribution and descriptions of new species. Occ. Papers Cal. Acad. Sci. 8: 1–281.

—— 1922. The North American species of *Gyrinus* (Coleoptera). Trans. Am. Ent. Soc. 47: 269–306, pl. XVI.

Folsom, J. W.—1914. Entomology with special reference to its biological and economic aspects. Blakiston's, Philadelphia. (Second revised edition.)

Fowler, W. W.—1912. The fauna of British India including Ceylon and Burma. Coleoptera. General Introduction and Cicindelidae and Paussidae. Taylor and Francis, London.

de Kerherve, J. B.—1922. Quelques reflexions sur les Gyrinides; dispersion, moeurs, hybridation. Bull. Soc. Sci. et Med. d. L'Ouest. 31: 31–38.

Kolbe, H.—1880. Zur Lebenweise des *Orectochilus villosus* Mull. Deutsche E. Z. 24: 228.

Kuhnt, P.—1913. Illustrierte Bestimmungs-Tabellen der Käfer Deutschlands. Pp. vii, 1138, figs. 10,350. Stuttgart.

Leconte, J. L.—1868. The Gyrinidae of America, north of Mexico. Proc. Acad. Nat. Sci. Phila., pp. 365–373.

Leng, C .W.—1911. A new species of Dineutes. Jr. N. Y. Ent. Soc. 19: 11.

Leprieur, G. E.—1881. (Cocoon of *Gyrinus niloticus.*) Bull. Soc. ent. Fr. 1881, p. LVIII.

Lesne, P.—1902. Contributions a l'étude des premiers états des Gyrinides. Bull. Soc. ent. d. Fr. 1902: 85–88. (Larvae from Pondicherry and nymph of *Orectochilus villosus.*)

MacGillivray, A. D.—1903. Aquatic Chrysomelidae and a table of the families of Coleopterous larvae. N. Y. St. Mus. Bull. 68: 288–331, pl. 20–31.

Miall, L. C.—1895. The natural history of aquatic insects. With illustrations by A. R. Hammond. London, pp. ix, 395, figs. 116.

Needham, J. C., and **Williamson, H. V.**—1907. Observations on the Natural History of Diving Beetles. Am. Nat. 41: 477–494, figs. 1–8.

Nowrojee, D.—1912. Life-histories of Indian insects—II. Some aquatic Rhynchota and Coleoptera. Mem. Dept. Agr. India, Ent. Ser. II: 165–191, pl. XX–XVI.

Ochs, G.—1924. On the West Indian Gyrinidae and a new species of *Gyretes* from northern Brazil. Am. Mus. Nov. 125: 1–8.

Osborn, H.—1886. Flight of Water Beetles. Ent. Am. 2: 63–64.

Regimbart, M.—1882–1907. Essai monographique de la famille des Gyrinidae. Ann. Soc. Ent. Fr. (6) II, 1882, p. 379–458, pl. 10–12; (6) III, 1883, p. 121–190, pl. 6; p. 381–482, pl. ii–iv; 1st Suppl. (6) VI, 1886, p. 247–272, pl. 4; 2nd Suppl. LX, 1891, p. 663–752, pl. 18–19; 3rd Suppl. LXXVI, 1907, p. 137–245.

—— 1907. Gyrinidae. Genera Insectorum 1 Fascicule. Bruxelles. pp. 1–12, pl. I.

Reitter, E.—1908. Fauna Germanica: Käfer. I Band. pp. vii, 248, figs. 64, pl. 40. Stuttgart.

Schaufuss, C.—1916. Calwer's Käferbuch. Band I., pp. 88, 709, figs. 244, pl. 20. Stuttgart.

Schiodte, J. C.—1841. Danmarks Eleutherata. Kobenhavn. (Not seen; reference taken from Wesenberg-Lund, 1913, p. 283.)

Sharp, D.—1868. On the British Gyrinidae. Ent. Mo. Mag. 5: 52–69.

—— 1882. On aquatic carnivorous Coleoptera or Dytiscidae. Trans. Roy. Dublin Soc. for 1882, (2) II: 179–1003, pl. vii–xviii (not seen; reference taken from Wilson, 1923, p. 344).

—— 1882. (Gyrinidae) pp. 46–52, Biol. Cent. Am. Insecta. Coleoptera. Vol. I, Part 2, pl. I, figs. 15–16.

—— 1914. The British species of *Gyrinus.* Ent. Mo. Mag. (N. S.) 25 (50): 128–130, pl. ix–x.

Sokolowsky.—1899. Vorbreitungsspiel zur Paarung bei *Orectochilus villosus.*. Zeitschr. f. Ent. Breslau. S. xviii.

—— 1900. Uber *Orectochilus. Ibid.*, S. xx.

(Neither of these papers were seen; references taken from Wesenberg-Lund, 1913, p. 283, who had not seen them.)

Turner, C. H.—1924. A new field method of investigating the hydrotropism of fresh-water invertebrates. Biol. Bull. 46: 35–54, pl. I–VII.

Weiss, H. B.—1914. Notes on the positive hydrotropism of *Gerris marginatus* Say and *Dineutus assimilis* Aubé. Can. Ent. 46: 33–34.

Wesenberg-Lund, C.—1913. Fortpflanzungsverhaltnisse: Paarung und Eiablage der Süsswasserinsekten. Fortschritte der Naturwiss. Fortschung. 8: 161–286, figs. 1–195 (extensive bibliography).

—— 1915. Hvirvlere (Gyrinidae), pp. 300–305, Kapitel XII, Insektlivet i Ferske Vande.

Wilson, C. B.—1923. Water beetles in relation to pondfish culture, with life histories of those found in fishponds at Fairport, Iowa. Bull. Bur. Fisheries. XXXIX (Document 953): 231–345, figs. 1–148 (extensive bibliography).

A NEW HYDROMETRID GENUS FROM HONDURAS (HEMIPTERA).[1]

By Roland F. Hussey, New York City.

During the spring of 1923, under the auspices of the United Fruit Company, Mr. T. H. Hubbell made an extensive collection of insects in various localities on the Atlantic slope of Honduras. A considerable portion of this material, which is now deposited in the Museum of Zoology of the University of Michigan, was secured in the Guaimas district of the Tela division, located about 65 kilometers up the Ulua River valley from Tela. Here a large area was being cleared and planted, and the original dense forest had been removed and the land burned over once or twice for a distance of about a kilometer on all sides of the camp at Farm 26, which was Mr. Hubbell's headquarters for his work in the Guaimas district.

Mr. Hubbell informs me that this region is nearly level, with little relief, and with only a few streams which run in arroyos cut deeply below the general level of the land. The collecting here was done in the dry season, and the Cabeza de Vaca Creek, which passes near the camp, was reduced to pools of stagnant water, with occasional stretches in which there was a very sluggish flow.

Among the Hemiptera of this collection which have been submitted to me for determination, there is one specimen of a remarkable Hydrometrid, taken at light on the screened window of the barracks at Camp 26. Inasmuch as the windows of this building look toward the Cabeza de Vaca Creek, it is to be presumed that this specimen came from that locality. Through the courtesy of Mr. John R. Johnston, Director of the Agricultural Research Department of the United Fruit Company, I have been authorized to publish its description separately.

Limnobatodes new genus.

Moderately elongate. Head rather slender, less than one and one-half times as long as the pronotum, subcylindrical at the base, swollen beyond the eyes, the swollen portion obo-

---

[1] Contribution from the Biology Department of the Washington Square College, New York University.

vate (as seen from above); tylus discrete from the frons, narrowed toward its base. Eyes coarsely agglomerate, situated distinctly behind the middle of the head. Antenniferous tubercles lateral, situated at about the middle of the preocular portion of the head, produced externally as a small vertical lamina, truncate at its apex, appearing like a small spine when seen from the dorsal aspect. Antennae 5-segmented, the first segment thickest, fifth longest, second and fourth shortest. Head above with four very slender, more or less flexible, erect hairs, arising each from the center of a small circular non-pigmented area, these areas situated two at the extreme base of the head and two on the posterior portion of the swollen apical portion,[2] the basal pair situated on small tubercles directed obliquely laterad. Bucculae high, short, entirely concealing the thick basal segment of the rostrum; rostrum with two visible segments, the first one extremely long, slender, the apical one short, attaining the mesosternum. Gular region broadly but shallowly sulcate behind the insertion of the rostrum.

Pronotum scarcely longer than wide, somewhat tumidly convex, provided with a broad flat collar anteriorly; lateral margins subparallel, posterior margin most obsoletely flattened, humeral tubercles distinct but not prominent. Scutellum not visible. Anterior acetabula sub-campanulate, as seen from the side, the apical margin distinctly thickened. Mesosternum rather broadly but shallowly sulcate. Posterior acetabula longest in antero-posterior direction, the coxae inserted ventrally. Odoriferous orifice single, situated in the midventral line at the posterior margin of the metasternum.

Legs mediocre. Coxae of all legs distinctly longer than wide, the posterior pair one-third farther removed from one another than from the sides of the body. Tarsi three-segmented, the basal segment minute, the third segment very shallowly excavated at the apex on the dorsal side and obliquely truncate below. Claws very minute, visible only with the highest power of the binocular microscope, preapical, inserted on the dorsal side of the tarsus, slightly curved (as seen from the side), their convex edges outward, tips hardly projecting beyond the apex of the tarsus.

---

[2] In Hydrometra the erect hairs are commonly short and arise from minute black pits: there are two pairs of them on the swollen apical part of the head and a dorso-lateral pair near the base. I can find no trace of hairs or ciliiferous areas in Limnobatodes corresponding to the most anterior pair in Hydrometra.

Abdomen with six ventral segments plus two genital segments (♀) Hemielytra semi-membranous, thicker toward the costal margin, not divided into clavus, corium, and membrane; venation as in Hydrometra.

Genotype: *L. paradoxus* n. sp.

Limnobatodes paradoxus n. sp.

Fuscous, head and pronotum somewhat shining, apex of head paler; fifth antennal segment, rostrum, coxae, and trochantera pale yellowish; apex of femora, extreme base and apex of tibiae, and tarsi pale; venter flavo-testaceous, the lateral margin broadly fuscous; hemielytra fuscous, the veins sparsely pilose, centers of the areoles and the entire anal margin, also the apical margin more obscurely, pale. Dorsal parts (except the pronotal collar) and the propleura impunctate, provided with numerous minute black spinules and with erect pubescence in addition. Pronotal collar with a transverse row of coarse punctures behind the middle. Ventral surface of head and thorax, mesopleura and metapleura with numerous shallow foveae, many of which, in the specimen before me, are filled with a white waxy-appearing substance.

Head more than 3½ times as long as its basal width, and about 2/7 longer than the pronotum, slightly tapering from the base to a point just before the eyes, then rather suddenly swollen for more than half of the preocular length, thence obliquely declivous above and convexly narrowing at the sides toward the apex; tylus transversely depressed near its base; gular surface (as seen from the side) almost straight. Antennal formula, segments I : II : III : IV : V = 8 : 3 : 8 : 3 : 9, rather remotely pilose, the apical segments a little more densely so. First visible rostral segment seven times as long as the second, second reaching to the intermediate coxae. Width of interocular space about equal to the diameter of an eye. Distance between anterior pair of ciliiferous spots about equal to the interocular width, that between the posterior pair one-half greater.

Pronotum alutaceous, evenly convex above, anteriorly behind the collar with a deep semi-circular impression with two deep foveae on its anterior margin; posterior margin broadly rounded; lateral margins very feebly convexly rounded. Meso- and metasternum pilose. Hind femora reaching the apex of the sixth ventral segment. Venter densely covered with short appressed pile; sixth ventral segment (♀) feebly produced backward on the median line, forming a short blunt spur at the base of the genital segment.

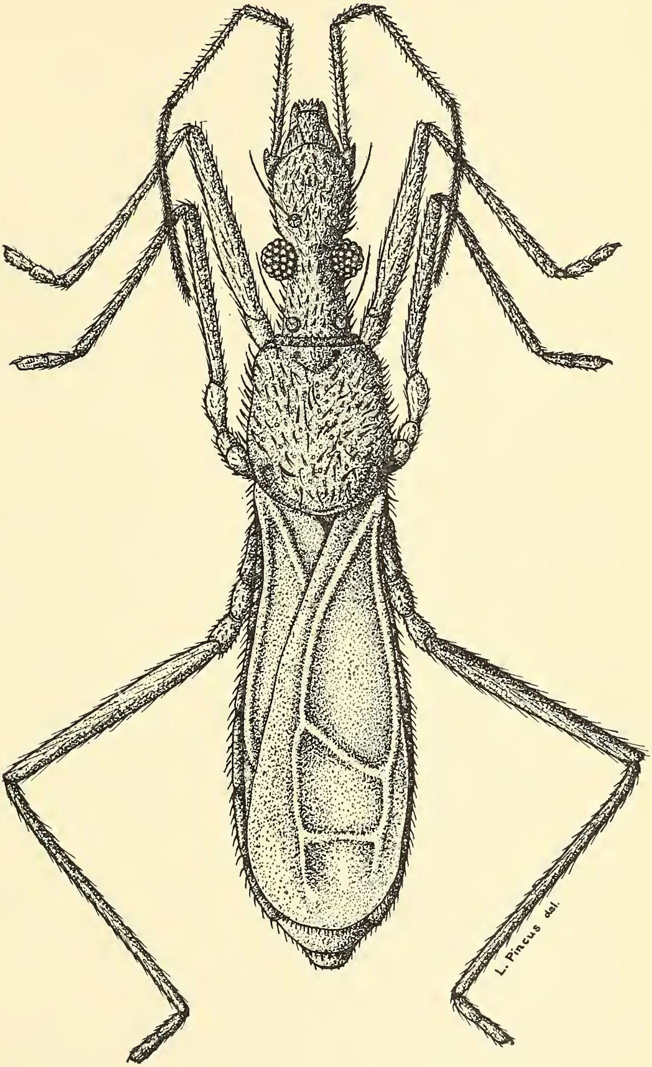
Length, ♀, 3.3 mm.; humeral width, 0.6 mm.

HONDURAS. Tela: Guaimas district, 8. V. 1923, at light (T. H. Hubbell). Type in the Museum of Zoology of the University of Michigan.

This remarkable form shows at once many points of agreement and of disagreement with *Hydrometra,* the only genus of this family known heretofore. Among the characters which the two genera possess in common may be cited: the venation of the hemielytra; the general structure of the head, subcylindrical at the base and swollen toward the apex; the laterally placed agglomerate eyes, remote from the pronotum; the structure of the rostrum, with its basal segment concealed between the bucculae and the second and third segments fused into one, so that the first visible segment is extremely long; the apically sulcate gula; the paired erect hairs on the head above; the general form of the acetabula and the insertion of the coxae; and the absence of lateral odoriferous orifices upon the metathorax.

Limnobatodes is at once distinguished from *Hydrometra* by its more robust form, the relatively longer swollen portion of the head, the five-segmented antennae, the rostrum reaching to the middle coxae, the number and greater length of the erect hairs of the head, the more coarsely facetted eyes, the pronotum scarcely longer than wide, the small but distinct omphalium, and the pre-apical dorsal insertion of the minute tarsal claws. In the accompanying figure the spinules of the head and pronotum are somewhat too large.

It may be noted here that, contrary to the opinion of Mayer, as reported by Bergroth (1906, Wien. Ent. Zeit., xxv, p. 6), the omphalium of the Gerroids represents the opening of a set of glands which is entirely distinct from those whose orifices are found in the paired lateral or ventro-lateral "ostia odorifera" as in the non-aquatic Hemiptera. The Veliidae possess the paired ostia, and the genus *Velia* has in addition a very distinct omphalium; and in the family Gerridae, though usually the ostia are vestigial and the omphalium quite distinct, the genus *Cylindrostethus* possesses distinct and functional orifices of both sorts. A further account of these glands will appear in another paper.


L. Pincus del.

LIMNOBATODES PARADOXUS HUSSEY.

THE AILANTHUS SILKWORM.

By Cartwright Farmiloe, F.E.S., London, England.

Amongst the large number of foreign silkworm moths, which it is possible to raise in captivity, *Philosamia cynthia,* or the Ailanthus worm is undoubtedly the easiest to rear.

This beautiful insect, whose original home is Java, was imported into the Northern States of America from China during 1861. Since that time it has continued to breed in large numbers, so that it may now be found fairly plentifully wherever the Ailanthus tree (*Ailanthus glandulosa*) occurs. But during the course of acclimatization certain changes have taken place, which have now rendered it more or less distinct from its original Asiatic ancestors. To distinguish it from its more distant relations, it is now frequently called *Philosamia cynthia advena,* signifying the new-comer.

The colors of this handsome insect are chiefly in tones of olive green or olive brown, carefully blended with soft tones of lilac pink and white. The body, which is thickly covered with silky fur and beautifully mottled, is small in comparison with the large and beautifully-shaped wings which measure between 5 and 6 inches across. This is a peculiar characteristic present in the majority of wild silk moths.

People who are in any way interested in the aesthetic side of nature, cannot fail to find a great deal of charm and interest in endeavoring to rear this delicate species. The cocoons may be bought during the Spring, usually at a comparatively low figure, and these evolve their moths during June or sometimes earlier if they are forced; in some cases, however, moths do not emerge before August, this usually depending on the locality from whence the cocoons were taken. I have found that cynthia moths, generally speaking, make their exit from their cocoons between 6 and 7 o'clock in the evening, some continue to emerge until 9 o'clock, but these times are greatly influenced by the surrounding conditions, which should be comparatively warm with a moist atmosphere. Prior to emergence, a small amount of liquid is exuded from the head of the moth. This, in most cases, would help to dissolve the gum which binds the silken threads together, and so help the moth to escape—but in the case of cynthia, although provided, this has little material use, for the cocoon already possesses an exit hole previously constructed by the caterpillar.

An interesting fact is that this aperture, to which I have just alluded, is only just sufficiently large to allow the undeveloped insect to squeeze through; so that during the operation of emergence, the wings, which at this period are exceedingly small, and in texture resembling little pieces of felt, are held by the sides of the cocoon, only being freed when the whole of the body has been allowed to pass out; in this way they are stretched already to twice their original length. The scales and long silken hairs with which they are clothed, are attached in a similar way to that in which the tiles are attached to a roof, and it is only due to this peculiar structure that the wings are not robbed of any of their beauty during this perilous moment.

When the insect is free it hastily climbs in search of a suitable position where it may rest whilst the development of its wings takes place. This position is not infrequently the underside of the cocoon.

The wings grow extraordinarily quickly once the blood has penetrated the main vein; it seems possible to almost see the rest of the wing unfurling with the naked eye, in fact the whole development takes little longer than 25 minutes. If development does not take place immediately after emergence, the wings, owing to the loss of their power of elasticity, are incapable of any further growth.

Cynthia moths possess a very characteristic odor, which can be easily detected within a very short distance, and which recalls the smell present in the young leaves and shoots of the Ailanthus.

When full development has taken place, these little creatures present a truly pretty picture. Their beautiful wings, together with their dainty little feet which resemble pieces of mottled velvet, are sufficient to make a great impression on one's imagination.

They show no resentment if carefully handled, and will immediately climb upon any article which is allowed to come in contact with their antennae or feelers, grasping it in the first place with their front legs and eventually taking hold with all six.

During the day they fly but little, and only break the monotony by the extraordinarily slow and lazy way in which they open and close their wings, suggesting the slow motion of a fan. This strange characteristic seems to be almost exclusively confined to this type of moth.

The females rarely fly during the first night, usually remaining in the same position as that which they took up for the growing of their wings. They show no resentment, however, to the continual approaches of the opposite sex, who usually locate their partners between the hours of dusk and midnight, and remaining with them until approximately noon the following day, unless previously disturbed.

The males of this variety are exceedingly active during the hours of 7 and 8 in the evening. They may be seen, one by one, to commence an extraordinary fluttering motion with their wings and after this has lasted for four or five minutes, they will immediately release themselves from that to which they have been clinging and take wing in the open air. This is a beautiful sight, as the flight of these creatures is vastly different to that which is generally associated with moths—being slow and resembling the wing strokes of a butterfly rather than the sudden spontaneous darting movements of moths.

The eggs of this species which are approximately 1/16 of an inch across, are oval and when first deposited are pale cream, eventually, as the maturation of the grub inside proceeds, turning to a green-gray color. They are laid in little masses, or dotted in perfect lines around twigs.

In this country the little caterpillars almost invariably hatch on the fourteenth or fifteenth day. They are at first yellow and appear to be speckled all over. They will eat privet and lilac and thrive well, but they greatly prefer the beans of their native tree the Ailanthus.

I have found that those which have been fed on privet take exactly twice as long as the others to grow to maturity. For the first half of their lives they live and feed together, always observing a formation, which consists of their heads always being pointed in the direction of the outside edges of the leaf.

They change their skins every 7 or 14 days, and as they grow they vary in color from orange to white. During this latter stage they become covered with a thick wax-like powder which appears to be excreted by the tubicles during the first few days after they cast off skins. During the last stages they become exceedingly handsome, the predominant color is a very pale green, almost white, and the legs are beautifully ornamented with markings of yellow, black and shades of rich ultra-blue. The tubicles which remain almost the whole of the time covered with the peculiar powder are actually of a pale ultramarine color. The head is pale apple green.

When the time arrives for the caterpillar to spin its cocoon, the colors alter slightly, sometimes taking on a creamy hue, and the worm which stops feeding soon commences to spin a girdle of silk around the stalk of the leaf which it has selected for the construction of its cocoon. In some cases, not being content with the making of a simple girdle around the leaf stalk, the little creature will go so far as to spin a complete girdle around the whole stalk as far as the main stem of the tree. In the case of the Ailanthus, the leaves are attached to a central stalk which may be as long as 2½ to 3 feet and half of this space is frequently covered with silk, so that during the fall, the silken band prevents the cocoon from being disengaged from the tree, and so rescues it from the perils which it would have to face, should it have fallen to the ground.

Note on Lixus fimbriolatus Boh.—June 4, 1905, the writer and later others collected this species at Chevy Chase, Md. Recently Mrs. D. H. Blake captured a pair at Riverdale, Md., *in copula* on *Helianthus stramosus,* probably the preferred larval food plant. The name was not included in the Ulke list of the Coleoptera of the District of Columbia, published in 1902. Comparison of a female from Chevy Chase with western material does not reveal specific or even varietal characters. This specimen is, however, smaller, much more slender and more depressed. Length, 11.0 mm.; width, 2.4 mm.; length of rostrum, ♀, 3.0 mm. A large specimen from Topeka, Kans. (Popenoe), measures 17.5 mm. long, 4.9 mm. wide, rostrum, ♀, 6.5 mm.—F. H. CHITTENDEN, Washington, D. C.

Apteromechus microstictus Fall.—Unexplainably, in preparing the manuscript of my article published in the April number of this BULLETIN the habitat and type locality of this species were omitted. The species is known to me only from Florida, the five examples in my collection being from St. Petersburg, Dunedin, Miami (Knull), " L. Poinsett 1.5 " (Schwarz) and Marion County. The type is from the first named locality and was collected by the writer April 6, 1923. The closely allied *A. ferratus* occurs also in Florida, and I have representatives of it from Miami and Paradise Key.—H. C. FALL.

NOTES ON NEW YORK THYSANOPTERA, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES. I.

By J. Douglas Hood, University of Rochester.

This is the first of a contemplated series of articles descriptive of the New York Thysanoptera. At the conclusion of these preliminary papers it is hoped that our knowledge of the forms occurring within the boundaries of the state will be sufficiently complete to permit the preparation of a general work on the subject, including analytical keys and suitable illustrations. To this end, the writer would welcome material from all parts of the state, and would be glad to furnish such special instructions for collecting as may be wanted. Material should be collected directly into 75 per cent. alcohol. Specimens received during the summer of 1925 will be fully credited as to source in the forthcoming List of New York Insects, which is being edited by Dr. M. D. Leonard, of Cornell University.

Heterothrips limbatus sp. nov. (Pl. IV, figs. 2 and 3.)

Female (macropterous).—Length about 1.2 mm. Color dark blackish brown (black to the naked eye); legs concolorous with body, excepting the tarsi, which are pale yellow and with the usual black spot at tip, and the fore tibiae, which are yellow and darkened with brown at base and along entire outer and inner surfaces; antennae concolorous with body, except for segment 1, which is slightly paler, and segment 3, which is bright yellow and faintly edged with brownish at extreme distal end; 3 and 4 suffused with orange pigmentation in the region of the sensoria; fore wings dark gray, excepting the usual white transverse band which involves the distal portion of the scale.

Head much wider than long (1.55 to 1.65), decidedly shorter than pronotum, widest about midway between eyes and base, cheeks arcuately rounded; surface with a few minute bristles, impressed and transversely rugose in front of anterior ocellus, nearly smooth between ocelli, and with five or six deep, anastomosing striae on occiput; frontal costa with deep, U-shaped emargination; ocellar area distinctly raised and convex. Eyes setose, about two-thirds as long as head and about as wide as their dorsal interval. Ocelli of posterior pair about twice the diameter of anterior ocellus, distinctly more than half as wide as their interval, directed upward and outward. Antennae nearly or quite 2.9 times as long as head, of normal form and structure[1] except that segment 3 is distinctly more than three times as long as wide. (Pl. IV, fig. 3.)

Prothorax about 1.33 times as long as head and about 1.5 times as wide as long, sides and posterior margin rounded, anterior margin nearly straight; notum with a few short, inconspicuous bristles and with distinct, though not conspicuous, anastomosing lines of sculpture. Wings of fore pair slightly more than twice as wide near base as at middle, the greatest sub-basal width (exclusive of scale) about one-ninth the length of wing; costal margin, anterior vein, and posterior vein with about 39, 26, and 19 short, moderately stout bristles, respectively.

Abdomen stout (as is usual in the genus); pubescence sparse, disposed on the usual prominent, almost reticulate, lines; posterior margins of abdominal tergites 2–5 fringed their *entire* width with contiguous, chitinous scales or plates whose distal margins are very evenly produced in short, slender spines (Pl. IV, fig. 2); tergites 1, 6, and 7 with similar scales at sides only, the median third of 1 bare, that of 6 and 7 and the entire margin of 8 occupied each by a regular comb formed of long, slender spines arising from the posterior margins of the tergites themselves; sternites 2–6 fringed posteriorly with regularly disposed scales whose distal margins are produced into many very fine, slender spines.

Measurements of holotype (♀): Length 1.23 mm.; head, length 0.120 mm., greatest width 0.173 mm.; pronotum, length 0.161 mm., width 0.246 mm.; pterothorax, width 0.324 mm.; fore wings, length 0.930 mm., width at middle 0.044 mm., near base 0.100 mm.; abdomen, width 0.356 mm.

Antennal segments	1	2	3	4	5	6	7	8	9
Length (μ)	28	42	94	57	33	35	20	17	21
Width (μ)	34	29	28	28	20	18	14	12	8

Total length of antenna, 0.346 mm.

Male (macropterous).—Length about 1.0 mm. Color and structure essentially as in female, but more slender and with longer head; segment 3 of antennae fully four times as long as wide; abdominal tergites and sternites fringed posteriorly as in female; tergite of segment 9 without finger-like chitinous processes, but with the two usual pairs of long, strong bristles behind middle; sternites 4–8 with the usual transverse, pale, non-chitinous areas at their extreme anterior margins, highly variable in form though usually progressively larger posteriorly.

---

[1] For illustrations of the antennae of related species see Hood, Ins. Insc. Menstr., Vol. III, 1915, figs. 1, 2, 4, and 6.

Measurements of allotype (♂): Length 0.98 mm.; head, length 0.116 mm., greatest width 0.149 mm.; pronotum, length 0.152 mm., width 0.211 mm.; pterothorax, width 0.263 mm.; fore wings, length 0.645 mm., width at middle 0.042 mm., near base 0.088 mm.; abdomen, width 0.213 mm.

Antennal segments	1	2	3	4	5	6	7	8	9
Length (μ)	28	37	88	50	33	36	24	16	18
Width (μ)	31	27	21	21	19	18	13	12	8

Total length of antenna, 0.330 mm.

Described from three individuals of each sex, taken by the writer at Macedon, New York, June 7, 1924, from flowers of *Prunus* sp.

This is probably the most easily recognized *Heterothrips* thus far described, differing sharply from all other species of the genus in that there is no median gap in the armature of the posterior margin of the tergites of the intermediate abdominal segments. The usual plan of the chitinous fringe, that of *H. arisaemae,* is shown in Fig. 1 on the accompanying plate, while that of the present species is illustrated in Fig. 2.

Heterothrips arisaemae Hood. (Pl. IV, fig. 1.)

Heterothrips arisaemae Hood, Bull. Ill. State Lab. Nat. Hist., vol. viii, 1908, p. 362, fig. 1.—Moulton, Tech. Ser. 21, Bur. Ent., U. S. Dept. Agr., 1911, pp. 17, 28.—Morgan (in part only), Proc. U. S. Nat. Mus., Vol. 46, 1913, p. 44.—Hood, Ins. Insc. Menstr., Vol. V, 1917, p. 56.

Originally described from Illinois and subsequently recorded by Morgan from Tennessee and by the writer from Virginia and Maryland, this species is represented in the material before me by a series of females taken at Macedon, New York, May 30, 1924, in flowers of *Arisaema triphyllum.* Morgan's records of the species from Florida require verification, as his specimens were from *Rhododendron* and honeysuckle; and his record of the species from Appomatox, Virginia, on grape, I have elsewhere[2] cited as pertaining to *H. vitis* Hood. *Arisaemae* has been taken only in the flowers of the two species of *Arisaema*—Indian Turnip or Jack-in-the-Pulpit (*A. triphyllum*) and Green Dragon or Dragon Root (*A. dracontium*). It is usually very abundant, and in the latitude of Washington, D. C., has been taken most commonly in late April and early May. It has never been met with earlier than April 19 nor later than June 8, and the immature stages have never been found. Where and in what stage it spends the remainder of the year is unknown.

---

[2] Ent. News, Vol. xxvii, 1916, p. 106.

This species and the preceding one are the only representatives of the genus known to occur in New York.

Phloeobiothrips gen. nov.

(*φλοιὸς*, bark; *βίος*, life; *θρίψ*, a wood worm.)

Dorsal surface not deeply roughened nor deeply reticulated. Head very long, in the type species about 1.5 times as long as wide; occiput arched and swollen as seen from the side; eyes very small; cheeks with distinct, bristle-bearing warts; mouth cone short, broadly rounded at tip. Antennae eight-segmented, the terminal segment pedicellate. Fore tarsus of female unarmed; femur of male unarmed.

Type species: *Phloeobiothrips tumiceps* sp. nov.

In addition to the new species described below, this genus embraces *Phloeothrips* (*Hoplandrothrips*) *insolens* Hood. It is close to *Phlaeothrips* Haliday, but differ markedly in the form of the head, the unarmed fore tarsus of the female, and the differently shaped mouth cone. The first two of these characters separate it also from *Hoplandrothrips* Hood, in which one of its species was originally described, the male then being unknown.

Phloeobiothrips tumiceps sp. nov. (Pl. IV, figs. 4–8.)

Female (brachypterous).—Length about 2 mm. General color dark blackish brown (black to the naked eye), with maroon hypodermal pigmentation in head, thorax, and abdomen, exclusive of tube; antennae dark blackish brown, with basal two-fifths or less of segment 3 bright yellow, and the base of 1, and pedicels of 4, 5, and sometimes 6, yellowish; legs concolorous with body, except tarsi and all articulations, which are paler and yellowish.

Head (Pl. IV, figs. 4 and 7) about 1.54 times as long as wide, more than twice the median length of pronotum; sides subparallel, converging roundly to eyes and slightly to near base, thence somewhat diverging; occiput elevated, swollen, the eyes at a decidedly lower level; median portion of head nearly smooth, noticeably subreticulate laterally; cheeks each with about six bristles visible in profile, arising from short tubercles; vertex subconical, very slightly produced, somewhat overhanging; postocular bristles longer than eyes, dilated apically; middle of dorsum with a pair of pointed, accessory bristles half as long as postoculars. Eyes very small, about one-sixth as long as head, hardly as long as wide, somewhat narrower than their interval. Ocelli of moderate size, nearly equidistant; anterior ocellus borne at tip of vertex, posterior ocelli slightly in advance of center of eyes. Antennae about 1.5 times as long as head, slender; segment 3 clavate (Pl. IV, fig. 8); 4–7 pedicellate; 8 sublanceolate, pedicellate, about 2.6 times as long as wide (Pl. IV, fig. 5); sense cone formula:[3] 3, 1–2; 4, 2–2; 5, $1\text{–}1^{+1}$; 6, $1\text{–}1^{+1}$; 7 with one on dorsum near apex. Mouth cone short, nearly attaining base of prosternum, labium broadly rounded at tip, slightly surpassed by the pointed labrum.

Prothorax hardly half as long as head and (inclusive of coxae) slightly less than 2.5 times as wide as long; pronotum faintly subreticulate along posterior margin and on either side of median line near anterior margin, anterior and posterior margins nearly concentric; all usual bristles present, dilated at tip, shorter than postoculars, antero-marginals shortest. Pterothorax narrower than prothorax, sides nearly straight and parallel excepting for the projecting anterior angles. Wings short, not nearly attaining base of abdomen, with two long, apically dilated bristles which are about comparable with the antero-marginals on pronotum. Fore tarsus without trace of tooth.

Abdomen about 1.2 times as broad as width of prothorax across coxae; tube nearly two-thirds as long as head, 2.7 times as long as basal width, about twice as wide at base as at apex, sides straight. Lateral bristles mostly knobbed, yellowish, of moderate length but shorter than in *insolens,* those on segment 9 only half as long as tube; terminal bristles nearly equal in length to tube, brownish, pointed.

Measurements of holotype (♀): Length 2.02 mm.; head, length 0.342 mm., greatest width 0.222 mm.; width near base 0.207 mm.; eyes, length 0.057 mm., width 0.060 mm., interval 0.066 mm.; postocular bristles, length 0.084 mm.; pronotum, length 0.158 mm., width (inclusive of coxae) 0.383 mm.; pterothorax, width 0.354 mm.; abdomen, width 0.452 mm.; tube, length 0.225 mm., width near base 0.082 mm., at apex 0.040 mm.

---

[3] The explanation of the formula used in the description of the antennal sense cones has been given by the author in Ann. Ent. Soc. Amer., Vol. I, 1908, p. 285, and in Ent. News, Vol. XX, 1909, p. 29, footnote.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	48	66	84	76	80	66	54	44
Width (μ)	44	34	36	34	31	29	26	17

Total length of antenna, 0.52 mm.

Male (brachypterous).—Length about 1.7 mm. Color and structure essentially as in female, but with head, antennae, and body (particularly the abdomen) more slender; fore tarsus sometimes unarmed, sometimes with a short, blunt tooth (Pl. IV, fig. 6).

Measurements of allotype (♂): Length 1.65 mm.; head, length 0.279 mm., greatest width 0.177 mm., width near base 0.165 mm.; eyes, length 0.056 mm., width 0.048 mm., interval 0.056 mm.; postocular bristles, length 0.076 mm., pronotum, length 0.135 mm., width (inclusive of coxae) 0.315 mm.; pterothorax, width 0.300 mm.; abdomen, width 0.327 mm.; tube, length, 0.173 mm., width at base 0.065 mm., at apex 0.034 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	44	56	74	70	71	61	50	38
Width (μ)	38	32	30	32	28	27	26	17

Total length of antenna, 0.46 mm.

Described from 19 ♀ ♀ and 4 ♂ ♂ taken by the writer under bark of fallen branches and saplings in a lowland woods near Macedon, New York, May 11, October 26, November 5, and November 9, 1924.

This species is close to *Ph. insolens* (Hood),[4] but may readily be known by the dark, blackish brown, instead of yellow, tibiae. The insect is of a much darker color throughout than *insolens*, and the third antennal segment is yellow only in the basal portion. In *tumiceps*, furthermore, the eighth antennal segment is about 2.6, instead of 3, times as long as wide; the abdominal bristles are shorter, those at the sides of segment 9 being about half as long as the tube, instead of nearly as long; and the tarsal tooth of the male is either entirely wanting or, more rarely, short and blunt (Pl. IV, fig. 6), instead of moderately long and acute.

---

[4] One female and one male of *insolens* were taken by Dr. J. W. Folsom at Homer, Illinois, March 8 and March 2, 1924, respectively, under bark on *Acer saccharum*. This brings the total number of known specimens of this species to five, of which two are males.

EXPLANATION OF PLATE V.

(J. D. H. del., all camera lucida, except Fig. 7.)

Fig. 1.—*Heterothrips arisaemae* Hood. Posterior margin of second abdominal tergite at right of median line, ♀.

Fig. 2.—*Heterothrips limbatus* sp. nov. Posterior margin of second abdominal tergite at right of median line, ♀, paratype.

Fig. 3.—*Heterothrips limbatus.* Segment 3 of left antenna, ♀, paratype.

Fig. 4.—*Phloeobiothrips tumiceps* gen. et sp. nov. Head and prothorax, ♀, paratype, dorsal view, showing sculpture of portion of head (all bristles on legs and antennae omitted).

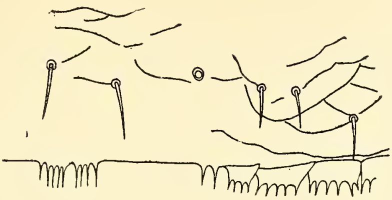
Fig. 5.—*Phloeobiothrips tumiceps.* Tip of left antenna, ♀, paratype.

Fig. 6.—*Phloeobiothrips tumiceps.* Right fore tarsus, ♂, allotype (all bristles omitted).

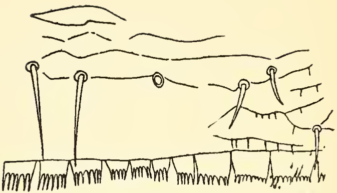
Fig. 7.—*Phloeobiothrips tumiceps.* Head and prothorax, ♀, paratype, lateral view (all minor bristles omitted).

Fig. 8.—*Phloeobiothrips tumiceps.* Segment 3 of left antenna, ♀, paratype.

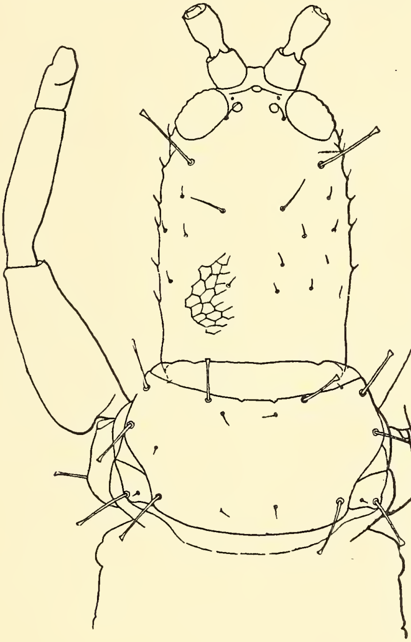
CORRECTION.—The reference in the paper on Aquatic Hemiptera, by Wm. E. Hoffman (this BULLETIN, 1923, p. 9) to the previous year was to 1923, the year of the experiments.



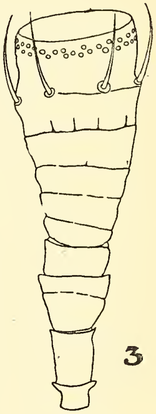
1



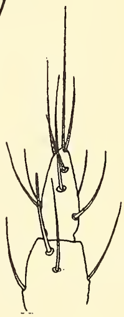
2



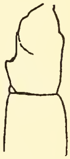
4



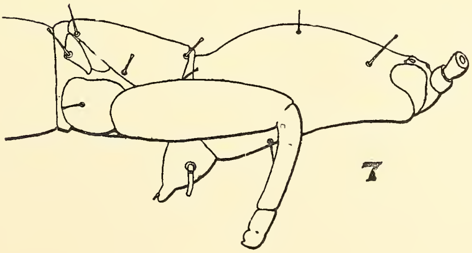
3



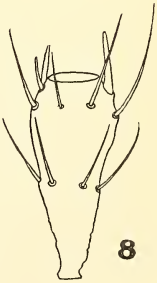
5



6



7



8

COLLECTING MICROVELIA IN HAWAII.

By William E. Hoffmann, Department of Biology, Canton Christian College, Canton, China.

On the third of August, 1924, in company with a party of friends, the writer spent a day in the rain forest near Honolulu. Returning home late in the day he had the good fortune to find eight specimens of *Microvelia pacifica* Kirkaldy. The specimens, all winged and representing both sexes, were collected in a small temporary pool in the road. The basin of the pool was formed by the wheels of passing automobiles sinking into the mud and was about three feet in length, a few inches wide, and three or four inches deep. The water had fallen during an afternoon shower as there was no water there earlier in the day. This showed that the bugs had flown into the pool during the day. It is said that specimens of *Microvelia* are sometimes collected at lights at night but the author has never so taken them.

Wishing to study *Microvelia pacifica* Kirk. afield, the writer spent a part of a day (August 9) collecting and observing them. Walking up Monoa Valley a small body of water was observed near the road. This proved to be a pool which was spring-fed and in it there was a luxuriant growth of *Spirogyra.* The pool was about ten feet long, about four feet wide at its greatest width, and eighteen inches deep. The water was entering at one end of the pool and leaving at the other. In the pool and especially in the water buffalo tracks at its lower end, were to be found *Microvelia.* Males and females of both winged and wingless forms, as well as a number of nymphs were taken. The alate adults far outnumbered the apterous ones, the latter being, perhaps, the progeny of the former.

The adults and nymphs remained at the water's edge, the former often running upon the moist earth bank. Both nymphs and adults were very active. The collecting spoon[1] was found to greatly facilitate the collection of specimens. A search was made for the eggs but none was found. One adult *Buenoa* and a few mosquito larvae were the only other inhabitants observed in the pool.

After spending several hours here we found our way farther up the valley. The road crossed a rapid little stream and it was decided to search there for the little surface dwellers. Upstream a few yards from the bridge the *Microvelia* were taken in great numbers. Dredging among sparse vegetation along the edge of the water with a water net resulted in a good catch. Then a pool between a large boulder and the bank was examined and congregated there were more live *Microvelia* than the writer had ever seen in one place. The water here was about four inches deep and shaded by vegetation which grew in and over it. *Microvelia* nymphs and adults literally covered the surface of the pool. There were more nymphs than adults, and of the latter only one or two were winged.

---

[1] "Handy Collecting Apparatus," Entomological News, XXXV.

Several mating pairs of apterous bugs were observed. After much effort one such mating pair was observed under the hand lens. The male grasped the body of the female firmly with his anterior legs. Sometimes the intermediate legs touched the body of the female slightly, as if to steady and not to grasp. The posterior legs were entirely free from the body of the female. Once during the observation the male was seen to vibrate the intermediate and posterior legs.

In disturbing the vegetation several large *Cicadellid* nymphs were frightened into the water. As soon as they struck the surface of the water they were pounced upon by great numbers of the hungry little bugs. Keeping in mind the apparent paucity of insects along the stream, as well as the great numbers of *Microvelia,* it is not surprising that the latter were in a half-starved condition.

A search for eggs was finally rewarded by the finding of a small floating stick, on which several eggs had been deposited. They looked not unlike the eggs of the six species of *Microvelia,* reared by the writer, at the University of Minnesota during the past year.

A number of nymphs were taken home for more careful examination. A series of measurements indicated that this species has five nymphal stages. This point is hard to determine definitely by simply measuring nymphs collected in the field. If one could always be sure of the sex of the specimens measured the matter would be much simpler. To be absolutely certain of the number of stages, the bug should be reared. This the writer proposes to do if his stay in Hawaii permits.

EUMENES DYSCHERUS H. DE SAUSSURE, A NEOTROPICAL, NOT AN AFRICAN WASP, AND OTHER NOTES ON SYNONYMY (HYMENOPTERA).

By J. Bequaert, Department of Tropical Medicine, Harvard Medical School.

In his "Monograph of the Solitary Wasps," H. de Saussure describes, under the name "*Eumenes dyschera,*" an insect stated to have come from tropical Africa. The species has been generally ignored since. In my "Revision of the Vespidae of the Belgian Congo" (1918), I attempted to recognize it in a melanistic color phase of *E. campaniformis* (Fabricius), occasionally met with in the Belgian Congo. There were, however, several points in which the description disagreed with the Congo specimens.

Fortunately, de Saussure's type is still in existence at the British Museum, where some time ago I had occasion to study it. It bears no definite locality label, so that quite possibly the habitat was merely surmised as African on account of the superficial resemblance with *E. maxillosus* (de Geer). As a matter of fact the two species are structurally not in the least related. In the same collection I found, next to de Saussure's type, five females of Rio Grande do Sul, Brazil (R. von Ihering Coll.), which agree with it in every respect. A note in the late Meade Waldo's handwriting, pinned near the American specimens, reads: "I can see no difference in the specimens labelled Rio Grande do Sul from the African form. Possibly the specimens were imported on ship board. G. M. W. 25. V. 1909." Among the many hundreds of *Eumenes*, of all parts of Africa, which have passed through my hands, I have never seen anything approaching *E. dyscherus* and I am quite convinced that it is a truly American wasp and does not occur on the African continent.

Moreover, further research shows that *E. dyscherus* is really a widely distributed, Neotropical insect, which has been redescribed several times. H. de Saussure named it *E. chalicodomae* in 1875, while *E. magna* Brèthes (1903) and *E. centralis* P. Cameron (1906) are likewise the same species. I have examined the type of *E. centralis* at the British Museum and through the kindness of Mr. S. A. Rohwer, I was able to compare a specimen of *E. magna,* of Puerto Bertoni, Paraguay, determined by Brèthes and now at the U. S. National Museum.

Eumenes dyscherus H. de Saussure.

Eumenes dyschera H. de Saussure, Et. Fam. Vesp., I, 1852, p. 50 (♀) (locality given by error as tropical Africa).

Eumenes chalicodomae H. de Saussure, Synopsis of American Wasps, 1875, p. 108 (♀) (type locality: Pernambuco, Brazil).

Eumenes magna J. Brèthes, An. Mus. Nac. Buenos Aires, (3) II, 1903, p. 258 (♀) (Novo Friburgo and Jundiahy, Brazil; Chiquitos, Bolivia); (3) VI, 1906, p. 335. Zavattari, Zool. Jahrb. Abt. Syst., XXXI, 1, 1911, p. 53 (♀ ♂); Arch. f. Naturgesch., Abt. A, LXXVIII, Heft 4, 1912, p. 120.

Eumenes centralis P. Cameron, Zeitschr. Syst. Hym. Dipt., VI, 1906, p. 128 (♀) (Panama). J. Brèthes, Ann. Soc. Ent. France, LXXXVIII (1919), 1920, p. 394.

The chief morphological characters of the female are as follows: Head slightly longer than wide. Eyes about as far apart on the vertex as at the clypeus (rather closer together on the vertex). Vertex and temples well developed, the vertex posteriorly with a slight longitudinal impression and anteriorly with a transverse, curved groove above each of the posterior ocelli. Ocelli quite close together, separated by two elongate, low swellings; the posterior ocelli a little less than one and one-half times as far apart as from the inner orbits. Front strongly raised and carinate between the antennae; the upper part of the swelling with a deep, impressed line which continues to the anterior ocellus and bears a pit about midway. Clypeus much longer than broad; its lower, free portion about as long as the upper, interocular part; its anterior margin over one-half the total width; moderately, somewhat angularly, and rather narrowly emarginate, the edges being very broadly rounded and almost lobate; in each edge ends a longitudinal, low carina, which extends to near the middle of the clypeus. Thorax much longer than high in profile, distinctly depressed, the mesonotum but slightly convex. Pronotum straightly truncate and sharply rimmed anteriorly; at the humeral angles the rim is regularly rounded off downward and followed behind by a groove-like contraction when viewed from above. The parapsidal furrows are deep in the posterior third of the mesonotum. The epimeron of the mesopleura is conspicuously swollen in its upper part into a blunt tubercle; the lower half of the mesopleura bears anteriorly a deeply impressed line, behind the epinemial depressions for the fore legs. Propodeum rounded off at the sides, divided by a longitudinal groove which is quite deep and broad, except immediately behind the postscutellum. First abdominal segment (petiole) a little shorter than the thorax; with a very narrow, stalk-like, basal third; the remainder fairly parallel-sided, from two to two and one-half times as long as wide; the passage between the two portions abrupt; the wider portion is somewhat flattened or longitudinally grooved behind and presents, shortly before the apex, a very deep pit; the apical margin is not appreciably swollen and forms no projecting edges, while the spiracles are not raised. The apical margin of the second segment is not duplicate, but the tergite bears, shortly before the apex, a slightly depressed, transverse, punctate line. The second sternite shows over most of its surface a longitudinal, quite low and blunt ridge, fading away before the apex, where it is more or less connected with similar, transverse, arcuate ridges or flattened swellings; these structures are much less apparent in certain specimens than in others.

The puncturation is quite peculiar, being of two kinds: on head and thorax one finds, first, rather large, but sparse punctures, which are coarser and denser on the pronotum and more remote on the mesonotum; the intervening spaces are quite densely covered with a minute puncturation. The clypeus is irregularly rugulose, somewhat longitudinally so on the lower half. The tegulae only bear the minute puncturation, which also covers most of the abdomen; in addition there are a few, scattered, somewhat larger punctures on the tergites, which are especially prominent and closer before the apex.

The antennal hook of the male has not been described.

The coloration is black and ferruginous; but, as noted by Brèthes and Zavattari, it varies a great deal. Sometimes the ferruginous color is restricted to spots on the front, pleura, and fore legs. Then we find all transitions to specimens which have the head and thorax quite extensively ferruginous; and that color may even extend over the sides of the first and second abdominal segments. The clypeus is ferruginous. Generally there is a narrow, ivory-white line at the apex of the first tergite; occasionally this may be absent. The wings are deep black, with strong violaceous reflections. In coloration *E. dyscherus* is the exact copy of the typical color phase of the African *E. maxillosus* (de Geer), which also varies considerably in the extent of ferruginous and black. Among South American wasps, the same type of livery is presented by certain color phases of *Zethus mexicanus* (Linnaeus).

The length varies considerably (total length 17 to 23 mm., according to Zavattari). H. de Saussure's type of *E. dyscherus* measured 20 mm. from front to apex of second tergite.

The species is evidently quite closely allied to *E. wagnerianus* H. de Saussure, of which I have before me four females collected by Mr. L. H. Viereck at Vista Nieve, San Lorenzo Mt., Colombia, December, 1922. The different shape of front and vertex, the absence of a tubercle on the epimeron of the mesopleura, and the shape of the second sternite, which not only lacks the peculiar ridges of *E. dyscherus,* but is visibly swollen before the base, sufficiently indicate that *E. wagnerianus* is specifically distinct.

The distribution of *E. dyscherus,* as known at present, includes Uruguay, Paraguay, Brazil (States of Rio Grande do Sul, Sao Paulo, Espiritu Santo, Minas Geraes, Rio de Janeiro, Piauhy, Pernambuco, Maranhao, and Pará), British Guiana, Bolivia, Eastern Peru (Chanchamayo), Venezuela, and Panama. Mr. Nathan Banks collected a female at Barro Colorado, Canal Zone, June 21, 1924.

Brèthes included *E. dyscherus* in the same subdivision of *Eumenes* with *E. canaliculatus* (Olivier), while Zavattari transferred it to the division *Alpha* of de Saussure, where de Saussure had placed the allied *E. wagnerianus.* It should be noted, however, that the division *Alpha* (H. de Saussure, Et. Fam. Vesp., III, 1856, p. 128) was first established for the " I$^{\text{ère}}$ division " of *Eumenes* in de Saussure's Et. Fam. Vesp., I, 1852, p. 28, and thus corresponds to *Eumenes, sensu stricto* (type: *Vespa coarctata* Linnaeus). That group, to which belong also most of the North American species, has the hind margin of the second segment distinctly duplicate, a condition which is not present in either *E. wagnerianus* or *E. dyscherus.*

Both *wagnerianus* and *dyscherus* should in my opinion be included in H. de Saussure's division *Delta* (Et. Fam. Vesp., III, 1856, p. 130), which may well be given subgeneric rank, with *Sphex maxillosus* de Geer as the type. The shape of the abdominal petiole or first segment is so variable that it hardly is useful for a division of *Eumenes* into subgenera. That it is quite misleading is evident from the fact that de Saussure placed his *E. wagnerianus* in the division *Alpha,* and his *E. chalicodomae* (= *E. dyscherus*) in the division *Zeta,* although both are very closely related. *E. dyscherus,* on the other hand, he had originally described in his "IIe division" or division *Delta*. In a forthcoming paper I shall indicate the natural groups of subgeneric value, which I believe may be recognized in the extensive genus *Eumenes.*

Eumenes campaniformis var. **pseudodyscherus,** new name.

Eumenes caffer var. *dyscherus* J. Bequaert, Bull. Amer. Mus. Nat. Hist., XXXIX, 1918, p. 74 (♂) (not *E. dyschera* H. de Saussure, 1852.)

It is necessary to propose the above new name for the melanistic color phase of *E. campaniformis,* which I had erroneously regarded as H. de Saussure's *E. dyschera.* It has only been found thus far in the Belgian Congo (Stanleyville and Walikale), and is of great interest because it mimics the typical color phase of *E. maxillosus,* as well as *E. lepeletieri* var. *hottentotus* H. de Saussure, both of which occur in the same region. It differs from them, however, in having the wings subhyaline with amber-yellow tinge, not purplish black.

As I shall show in a forthcoming paper on the South African *Eumenes, E. caffer* (Linnaeus) is morphologically quite distinct from *E. campaniformis* (Fabricius) and is, moreover, restricted to South Africa. The var. *pseudodyscherus* is structurally identical with *E. campaniformis,* of which it is one of several color phases found over the wide area inhabited by that species.

Eumenes dyschera G. K. Marshall, Trans. Ent. Soc. London, 1902, pp. 525, 570, and 572; Pl. XXI, figs. 16 (♂) and 17 (♀); Pl. XXII, fig. 14 (♂), of Rhodesia (Salisbury), is neither H. de Saussure's *E. dyschera* nor *E. campaniformis* var. *pseudodyscherus.* According to the figures it is *E. lepeletieri* var, *hottentotus* H. de Saussure.

Pachymenes andeus (Packard).

Montezumia andeus S. A. Packard, First Ann. Rept. Peabody Ac. Sci., 1869, p. 60 (♂) (Quito). Dalla Torre, Cat. Hym., IX, Vesp., 1894, p. 38 (wrongly credited to Smith); Gen. Insect., Vespidae, 1904, p. 27. Zavattari, Arch. f. Naturgesch., Abt. A, LXXVIII, Heft 4, 1912, p. 151. J. Bequaert, Rev. Zool. Afric., IX, 1921, p. 243.

Odynerus (*Hypodynerus*) *tapiensis* H. de Saussure, Rev. Mag. Zool., (2) XXII, 1870, p. 56 (♂) (Plateau of Tapia at the foot of Chimborazo); Synopsis of Amer. Wasps, 1875, p. 218 (♂). Schrottky, An. Soc. Cient.

Argentina, LV, 1903, p. 179. Zavattari, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 529, 1906, p. 19 (♀ ♂).

Odynerus tapiensis Dalla Torre, Cat. Hym., IX, Vesp., 1894, p. 100. Brèthes, An. Mus. Nac. Buenos Aires, (3) II, 1903, p. 268, footnote.

Odynerus (*Leionotus*) *tapiensis* Dalla Torre, Gen. Insect., Vespidae, 1904, p. 55.

Nortonia tapiensis Zavattari, Arch. f. Naturgesch., Abt. A, LXXVIII, Heft 4, 1912, p. 167, Pl. II, fig. 48 (♀ ♂).

The collections of the Museum of Comparative Zoölogy, at Cambridge, contain the male holotype and two paratypes of Packard's species, which has not been recognized since the original description. It is unquestionably the same insect as H. de Saussure's *Odynerus tapiensis,* described a year later. H. de Saussure notes that its appearance is that of a *Montezumia,* but the maxillary palpi are distinctly six-jointed, while the labial palpi are four-jointed.

The male offers many striking peculiarities: the clypeus is very deeply emarginate at apical margin, with long and sharp, lateral spines; the mandibles are long and dagger-like, their inner margin nearly entire; the posterior ocelli are much farther apart than from the inner orbits; the antennae are long and thick, the several segments being swollen toward apex; the tenth and twelfth segments are deeply emarginate at apex on the under side; the thirteenth (or hook) is very long and wide, narrowed at the base, then suddenly widened and curved, more or less spoon-like, ending in a blunt point; lateral ridges of propodeum very prominent and carinate, continuing below into the much lower, inferior ridges; the superior ridges not marked, the dorsal areas gradually passing into the concavity; middle femora conspicuously widened along the lower margin, with a deep, arcuate emargination before the base, excavated and with an oblique carina on the anterior face; first abdominal segment short campanulate, distinctly narrower than the second, but the sides gently rounded off and gradually tapering to the base; the first tergite somewhat flattened posteriorly and with a short, longitudinal groove before the apex; second tergite broad and flattened; second sternite raised anteriorly into a median, rounded tubercle, which drops abruptly toward the base of the segment; head and thorax coarsely and uniformly, rugosely punctured and densely covered with long, black, erect hair; clypeus finely alutaceous, without punctures, completely covered with silvery-white pile (in well-preserved specimens); abdomen nearly impunctate and somewhat shiny, the sternites and the first tergite with long, black hairs which are, however, much sparser than on the thorax; the remaining tergites bare; legs bare; all the tarsi and the hind tibiae densely covered with short, silky pile. The insect is black, including the clypeus; the apical half of the femora, the tibiae and the two basal joints of the tarsi are bright ferruginous-red; wings purplish-black. Length (h. + th. + t. 1 + 2): 14 mm. to 17 mm.

The female differs but little from the male, except in the sexual characters, such as the structure of antennae; the middle femora are normal; the clypeus is entirely black and somewhat longer than in the male; its apical emargination much less deep, the lateral edges forming sharp, but rather short teeth. The color is the same, except that the legs are more extensively ferruginous-red, the entire tarsi being of that color. Length (h. + th. + t. 1 + 2): 17 mm. to 18 mm.

One of Packard's two paratypes was a female deprived of the head, and probably on that account not recognized as such.

As pointed out by Zavattari, the species is peculiar to the Andean region of Ecuador and Peru, between 9,000 and 10,000 ft. I have both sexes from Cuzco, Peru.

This wasp has been placed in *Nortonia* by Zavattari, but, owing to the absence of a transverse carina on the first tergite, I believe that it properly belongs in *Pachymenes.* I have formerly called attention to the fact that the genotype of *Nortonia, Odynerus intermedius* H. de Saussure, possesses a transverse carina on the first tergite, as in *Ancistrocerus*; while the genotype of *Pachymenes, Pachymenes sericeus* H. de Saussure, lacks this crest (see Bull. Amer. Mus. Nat. Hist., XXXIX, 1918, pp. 90–94).

A STUDY OF THE INTERRUPTA–HARRISII GROUP OF THE GENUS ARCTOCORIXA WITH DESCRIPTIONS OF NEW SPECIES. (HEMIPTERA–CORIXIDAE.)

By H. B. Hungerford, Department of Entomology, University of Kansas, Lawrence, Kansas.

In 1825 Thomas Say described a large Corixid species from " Missouri " under the name *Corixa interrupta.* In 1878 Dr. P. R. Uhler, in a report upon the " Hemiptera-heteroptera in the collection of the late Thaddeus W. Harris," described another large Corixid under the name *Corixa harrisii.* These two species are about the same in size and general appearance, and, in the many collections I have examined, are hopelessly confused.

In 1913 Dr. James Francis Abbott, in the Washington University Studies, Vol. 1, No. 1, pp. 10–20, published a paper entitled, " The Variation of *Arctocorisa interrupta* (Say)." This was a report upon a study of 300 specimens consisting of 200 females and 100 males taken July 7, 1911, from a pool on Nonamesset Island, off the coast of Massachusetts. He found that the males fell readily into two series based upon the structure of the pala, the relative width of the interocular space and the pigmentation of the venter. One of these he called the *A. interrupta* type and the other the *A. harrisii* type. The females he was unable to arrange into two groups. His studies involved the measurement of various parts of the insects. From his inability to distinguish two types of females he concluded that "*C. harrisii* Uhler is a second (dimorphic) male form of *A. interrupta* (Say). The females are homogeneous and probably heterozygous for the two types." This conclusion of course would make *A. harrisii* (Uhl.) a synonym of *A. interrupta* (Say).

It has been my privilege to examine the identical material with which Dr. Abbott worked. The males were marked with red figures and arranged from 1 to 100. The females were marked with black figures and arranged from 1 to 200. I very shortly discovered that the color pattern, the nature of the surface of the pronotum and tegmina, and the shape of the vertex were distinctive marks which separated the *A. harrisii* (Uhl.) males from the *A. interrupta* (Say) males. I therefore separated the two sorts and found that there were 85 *A. harrisii* (Uhl.) and 15 *A. interrupta* (Say).

By these same characters the females were separated into two groups and when counted there were found to be 162 of the *A. harrisii* (Uhl.) type and 28 of the *A. interrupta* (Say).[1] While measurements may fail to show two kinds of females, the general facies enable the lot to be divided into: 85 males and 162 females of *A. harrisii* (Uhl.), and 15 males and 28 females of *A. interrupta* (Say). It is my belief that *A. harrisii* (Uhl.) is a valid species. I may add also that the claspers of the male genital bulbs are quite different.

In addition to the above there are two other described species of about the same size belonging to this group. One of these, *A. laevigata* Uhler, which was described from the far west, I have found in collections bearing New Jersey, Maryland, and Rhode Island locality labels. This is not in the least disquieting, since I have collected *A. edulis* Champ. in Kansas and Minnesota and have seen it from the east. The species was described from Mexico.

Among the large species of North American Corixidae which are to be assigned to the *A. interrupta* (Say) group are three undescribed species. These, as a rule, have been labeled *A. interrupta* (Say) and all of them are quite widely distributed. Indeed one of them which I have chosen to name *A. vulgaris* is our commonest large Corixid. The descriptions of the new species follow:

A. obliqua sp. n.

Size: Length 10 + mm. Width of head 3½ mm. in male to 3¾ mm. in female.

Color: General color effect dark. Pronotum crossed by 9 or 10 pale bands, usually equal to or a little more slender than the dark bands. The pale lineations of the tegmina short, more or less wavy and irregular in arrangement; those at base of clavus, and more especially at its inner angle, broader than the others. The pattern of membrane a continuation of that of corium without demarcation.

Structure: The head is short, the interocular space at synthlipsis not more than 2/3 the caudal margin of the eyes. The frontal depression on the face of the male concave, ovate, not attaining the eyes laterally. Pronotum with faint indication of a longitudinal median carina on anterior third. Surface of pronotum and tegmina rastrate. The pala of male elongate, sides parallel and distal end obliquely produced as shown in drawing. Plate IV, figure 4.

---

[1] Ten were missing.

Comparative notes: This last character enables the male to be recognized without further examination. The color pattern and general appearance approaches *A. interrupta* (Say) from which most specimens of both sexes may readily be distinguished by the more broken and irregular pale lineations of that portion of the corium which lies caudad of the claval suture.

This new species is described from 218 specimens from Douglas County, Kansas. The writer also has specimens from Minnesota, Texas, Iowa, Oklahoma, New Jersey, New York, Illinois, and Missouri.

Holotype, allotype and some paratypes in University of Kansas collection. Paratypes in United States National Museum, University of Minnesota, Cornell University, Carnegie Museum and the following private collections: J. R. de la Torre-Bueno, H. M. Parshley, R. F. Hussey, Carl J. Drake and H. G. Barber.

A. lobata sp. n.

Size: Length 9.4 mm.; width 3 mm. across head.

Color: General color effect dark. Head, limbs and venter yellow. Pronotum crossed by about eight broad black bands. The tegmina with pattern that appears much as described for *A. obliqua* above. The membrane is more or less separated from the corium by the fusion of the pale lineations.

Structure: The frontal depression on the face of the male is less distinct than in the preceding species and appears to reach the eyes laterally. The pronotum is coarsely rastrate. The median longitudinal carina even less marked than in *A. obliqua.* The pala of male elongate, sides nearly parallel, a trifle broader near the tip which is rounded. The genital capsule of the male has a prominent lobe in front of the base of the right clasper which suggested the specific name proposed. See drawings on Plate IV, figures 5 and 6.

Described from eight specimens taken by the writer in July, 1921, at St. Paul, Minnesota, and two specimens from Long Island, New York.

A. vulgaris sp. n.

Size: Length 9 to 10 mm.; width of head of male 3 — mm., of female 3.3 mm.

Color: General color effect dark. Darker than either of the species described above. The pale lineations slender and more complete. The pronotum crossed by 9 or 10 pale bands. The tegmina transversely marked with slender slightly zig-zag lines; those at base of clavus only slightly broader than elsewhere. Head and limbs pale. Venter, of males at least, dark.

Structure: Head short, interocular space broad. Synthlipsis: width of eye :: 1 : 1.2. Frontal depression of face of male shallow, not attaining the eye laterally. Pronotum and tegmina rastrate.

Comparative notes: This species is one of the two most distinctively marked species of this series. The slender, pale cross-lines, the roughly rastrate surface and the wider interocular space mark it at once. The structural details of pala and genital bulb are shown on Plate IV, figures 1 and 2.

Described from a considerable series taken in Douglas County, Kansas. Besides these, the writer collected 190 specimens at St. Paul, Minnesota; 211 specimens at Douglas Lake, Michigan, and 20 specimens at Ithaca, N. Y. In addition, there are before him others from Minnesota taken by W. E. Hoffman, from Michigan by R. F. Hussey, from South Dakota by H. C. Severin, from White Plains, New York, by J. R. de la Torre-Bueno, and from Ohio by C. J. Drake.

Two of the three species described above are common and widely distributed. These three species may be separated one from the other by the following key:

A. Pale bands of corium beyond hemelytral suture forming transverse parallel series. Interocular space wider than usual .... *A. vulgaris* sp. new.
AA. Pale bands of corium beyond hemelytral suture short, irregular in shape, giving a mottled rather than a cross-striped effect.
  B. Pronotum strongly rastrate and crossed by about 8 black bands .... *A. lobata* sp. new.
  BB. Pronotum more finely rastrate and crossed by 10 or more dark bands .... *A. obliqua* sp. new.

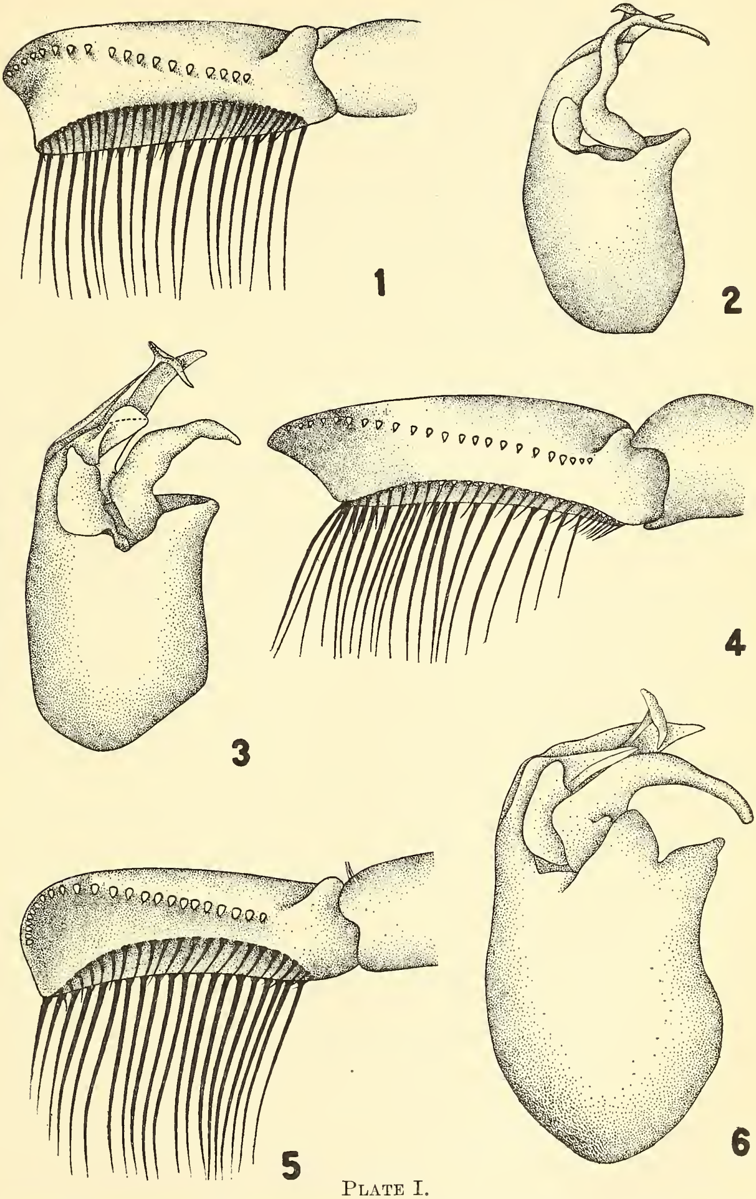


Plate I.

1. Pala of male of *Arctocorixa vulgaris* sp. n.
2. Genital bulb of *Arctocorixa vulgaris* sp. n.
3. Genital bulb of *Arctocorixa obliqua* sp. n.
4. Pala of male of *Arctocorixa obliqua* sp. n.
5. Pala of male of *Arctocorixa lobata* sp. n.
6. Genital bulb of *Arctocorixa lobata* sp. n.

CALIFORNIA BUTTERFLY NOTES—III.

By Karl R. Coolidge, Hollywood, California.

Vanessa carye Hubner.

In 1864, Dr. Behr wrote: "This species is by far the most common butterfly in California." This no longer holds true, the ubiquitous *Pieris rapae, Eurymus eurytheme* and *Vanessa cardui* far surpassing *carye* throughout the state in point of numbers. The food-plants of *carye* are:

Malvaceae.

Lavatera assurgentiflora Kell. Tree-Mallow. This is the only food-plant listed by Holland (Butt. Bk.). The Tree-Mallow is a shrub five to fifteen feet high and in the early days, especially about San Francisco, was planted as a wind-break hedge. There is a dispute among botanists as to the origin of *Lavatera* in California. By some it is held to be indigenous to the islands off the coast of Southern California, while others consider it an importation from the Old World.

Malva sp. Mallow. Cheeseweed. Commonly on *M. borealis* Linn. and *M. parviflora* Linn., both introduced from Europe and now very common weeds throughout California. These Mallows are the most frequently used food-plants of both *carye* and *cardui.*

Malvastrum sp. False Mallow. About Los Angeles, occasionally on *M. fasiculatum* (Nutt.) Greene. In the San Joaquin Valley and on the Mohave Desert eggs are commonly placed on *M. exile* Gray.

Sidalcea malvaeflora (Moc. & Sesse) Gray. Wild Hollyhock. On only one occasion I have found larvae on this.

Sphaeralcae ambigua Gray. Desert Mallow. A frequently used food-plant on the Colorado Desert.

Althaea. Hollyhock. Serves readily for larval food.

Fabaceae.

Lupinus arborens. Shrub Lupine. I give this on the authority of Miss McGlashan (Diurnal food-plant outline). While *cardui* will oviposit on the various species of *Lupines,* I have never personally observed eggs or larvae of *carye* on it.

URTICACEAE.

Urtica holosericea Nutt. Nettle. Very probably this constituted the main native food-plant before the introduction of the *Malvas*. In captivity the larvae take readily to *V. urens* Linn., a species of nettle imported from Europe.

The life history of *carye* has been described by Dr. Dyar, Can. Ent., vol. 21, p. 237, 1889, but as the egg was only briefly mentioned I offer a more detailed description.

Egg of carye. Short ovate, the base broad and round, tapering but slightly to the broadly rounded summit. Adorned with the usual series of prominent, high, equidistant transverse ribs. These increase in height as they proceed apically, where they terminate abruptly in a well-rounded outline, and here are .06 mm. high. These ribs vary in number—11, 12, 13—the smallest figure apparently being the commonest. The ribs are .12 mm. apart, and the surface between them is broken up by a series of numerous delicate transverse lines, .03 mm. apart. The micropyle, .10 mm. in width, holds a cluster of very delicately outlined roundish polygonal cells, subequal. Height of egg .72 mm. Width at base .30 mm.; greatest width .52 mm.; width at apex .26 mm. Color pale green, the ribs conspicuously pellucid.

In California *carye* is severely parasitized by the Tachina fly *Phorocera saundersii* Will., often as high as seventy-five per cent. of the larvae being so attacked.

Note on Podops cinctipes and Solubea pugnax.—On the evening of August 30, 1924, both nymphs and adults of *Podops cinctipes* Say were observed in considerable numbers on the cat-tail rushes (*Typha*) at the edge of the salt marsh at Old Place, Staten Island. This insect becomes active at night, and evidently feeds on the cat-tail rush. It is also found further inland. As stated in the Hemiptera of Connecticut, the insect is " occasionally taken under stones and in beach drift."

Along the James River in Nelson Co., Virginia, the writer has several times noted at night the bug *Solubea pugnax* Fab. at the tops of the tall and beautiful Johnson grass. Many pairs have been seen together on the grass at night during the early part of August, but none were observed during the day.—WM. T. DAVIS, Staten Island, N. Y.

NOTE ON THE BEHAVIOR OF LEPTOGLOSSUS OPPOSITUS SAY.

By F. H. Chittenden, Washington, D. C.

During the autumn of 1919 opoprtunity was offered for study of this species, which is known as the northern leaf-footed plant-bug. The third week of September nymphs were vigorously attacking growing corn stalks at Arlington, Va. All stages of nymphs and adults were also on large cheese squash. Injury probably would have been accomplished but for the fact that the fruit was practically killed by the pickle worm (*Diaphania nitidalis* Cram.) and attack was further complicated by the common squash bug (*Anasa tristis* DeG.).

September 23 the writer observed an adult and a last-stage nymph on a fruit tree growing on the Department of Agriculture grounds. Search was made during a cool spell following a storm with the result that large numbers of the insect were located on a nearby catalpa tree. This plant-bug, while eminently gregarious, had congregated in unusually close clusters on the lower surface of the leaves, different stages being represented in a cluster, some containing from two to 30 individual bugs. All stages were present, adults more abundant. The known fondness of this species for fruits was exemplified in its occurrence on catalpa pods on which the bugs could easily be seen hanging and silhouetted against the sky. A number placed in a large jar overnight massed themselves in two groups, one of which was strung along a pod. In the early morning at a temperature of 58° F. the insects were still seen in these locations on the tree, and in some cases, crawling slowly.

When disturbed, nymphs and adults, being flattened and light in weight and presenting considerable surface, are readily wafted by the wind. The majority of the bugs observed on trees were resting at a height of from 8 to 12 feet above ground, comparatively few being noticed either much higher or much lower in ordinary weather, but in the cool weather of late September and October they sometimes rest lower on the trees. Subsequently this species was found on catalpa at Arlington, Va., under similar conditions and temperature, but only in sunny places. When disturbed, they flew down to the grass reluctantly, and did not rise.

Since this species has previously been recorded by the writer to occur in the vicinity of the District of Columbia in July and the first stages of the nymph were noticed as late as the last week in September, it is probable that the individuals under observation in September and October represented the second generation. Adults were still abroad the third week of October, and on the 15th were observed on catalpa trees not previously infested. An adult was seen flying during the heat of the day at a temperature of 80° F. It flew strongly and rapidly, gradually going higher until lost to view. These plant-bugs are so sluggish as to be as easy of capture as squash bugs and related genera and are seldom seen flying except in extremely warm weather in direct sunlight. It seems probable that the adults observed October 15 were seeking places for hibernation since afterward few specimens are seen. During the following year not a single individual came under observation, although frequent search was instituted for them, but in early October, 1921, the species returned to Arlington, Va., in small numbers.

Occurrence of Meligethes aeneus Fab. in the United States. This nitidulid beetle has been collected on the flowers of *Ranunculus* and willow, and recently specimens have been seen from Bozeman, Mont., Utah, and Nevada. It has also been recorded from California and Indiana. Abroad, Taschenberg reports this species attacks mustard, and Ormerod calls it the turnip blossom beetle, stating that it injures opening buds and blossoms. While it evidently breeds on wild crucifers, no record is available of attack to cultivated Cruciferae in the United States. It is obviously not circumpolar, but an introduced species.—F. H. CHITTENDEN, Washington, D. C.

BOOK NOTES.

Fauna of New England. 15. List of the Diptera or Two-winged Flies. By Charles W. Johnson. Occasional Papers of the Boston Society of Natural History. February, 1925. 326 pp.

A concise and clear enumeration of the Diptera of the New England States will be greeted with satisfaction by every American student of the order. It is especially welcome on account of the concluding bibliography, which provides a partial supplement to Aldrich's "Catalogue," now sadly out of date. Mr. Johnson's reputation for care in naming specimens and for conscientiousness in nomenclatorial matters is a sufficient guarantee that the list is as accurate as one might expect of a single individual in so wide a field. He records some 3,300 species and varieties, about twice (1,661) as many as are listed in J. B. Smith's "Insects of New Jersey" (1910). The two areas have been nearly equally well explored, so that one feels justified in drawing comparisons. It is interesting to note that the number of forms depends not so much upon the extent of the territory—New England being over eight times as large as New Jersey—as upon the variety of faunal life-zones and ecological conditions. The Canadian life-zone, so notoriously rich in flies, is absent from New Jersey, while it covers much of Maine, New Hampshire, and Vermont. On the other hand, many southern forms of the Upper Austral, such as occur in the Pine Barrens of New Jersey, for instance, never reach Connecticut and Massachusetts. Thus in the family Tabanidae, of the 75 New England forms, 10 are not found in New Jersey; while of the 83 New Jersey species, 15 have not been observed in New England. In going over the list, one is also struck by the fact that in every family, or extensive genus, there are, besides widely distributed and common species, others that are either strictly local or met with at rare intervals only. It is not always apparent why this should be so. These and similar problems, if properly investigated, might disclose many facts of interest, and Mr. Johnson would be best qualified to undertake such a study. Some other features of the New England list may be discussed to better advantage after the catalogue of the insects of New York State, now in preparation, has been published.

Encyclopedie Entomologique. Serie B. Memoires et Notes. II. Diptera. Recueil d'études biologiques et systématiques sur les Diptères du Globe.

The attention of the dipterist may be called to this new periodical exclusively devoted to his field. According to the advertisement, it will publish papers in Latin, French, German, English, Spanish, and Italian. After all these dreary years of unbridled chauvinism, it is pleasant to witness a revival of truly international coöperation in the field of Entomology. The two numbers thus far received were issued in July and September, 1924, and contain papers by J. Villeneuve, C. Pierre, F. W. Edwards, O. Parent, J. M. R. Surcouf, E. Brunetti, M. Bezzi, and Th. Pleske; two of them deal with South American insects (Micropezidae and Tipulidae). Manuscripts should be sent to Mr. E. Séguy, 45bis, rue de Buffon, Paris-V^{e}; subscriptions (foreign: 40 francs a volume), to Mr. Paul Lechevalier, 12, rue de Tournon, Paris-VI^{e}. Authors receive 30 reprints free and a larger number at cost price.

Series A of the "Encyclopédie Entomologique" comprises memoirs too extensive for insertion in the periodical. Of this, five volumes have been issued thus far: among them an important study of the mosquitoes of Northern Africa and Syria, by Mr. E. Séguy, and a revision of the tabanids of France, by Mr. J. M. R. Surcouf. A monograph of the Stratiomyidae of the Palaearctic Region, by Th. Pleske, is also announced.—J. Bequaert, Department of Tropical Medicine, Harvard Medical School.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BUTTERFLY COLLECTORS.—Have you aberrations or freak butterfly specimens for sale or exchange? Professional and private collectors please write. Jeane Gunder, Pasadena, Calif.

HALIBURTON COUNTY, NORTHERN ONTARIO. Will collect in all orders. Many interesting specimens and probably new to fauna there. Especially in Lepidoptera, Coleoptera, Hemiptera, and Hymenoptera. Will visit the above in June. All mail will be forwarded to me. Correspondence promptly answered. Herbert S. Parish, 81 Robert St., Toronto, Canada.

ARKANSAS INSECTS.—Am again collecting. Have Lepidoptera on hand. Miss Louise Knobel, Hope, Ark.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

Wanted--Butterfly Aberrations

If you or your friend find an oddly marked or colored butterfly, I would like to hear about it.—These kinds of freak butterfly specimens are my personal hobby, and I am not a dealer.—If you are selling your collection, it is better to dispose of those specimens separately, to realize more.—Correspondents always promptly answered.

JEANE GUNDER, Pasadena, California

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages 1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII

Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀ ♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147	Butterflies for trays,
192	All glass mounts,
205	North American Lepidoptera,
249	Exotic Lepidoptera,
212	Insect pests, Summary of collections,
213	Exotic Coleoptera,
214	North American Coleoptera,
234	Insect collections,
229	Life histories of insects,
254	List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

NSEC

XX OCTOBER, 1925 No. 4

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

SMITHSONIAN INSTITUTION
OCT 29 1925
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed October 28, 1925

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1925

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

STUDIES OF NORTH AMERICAN AEGERIIDAE, Engelhardt 153
ON "ANNECTANT BUGS," Bergroth 159
NEUROPTERA AND MECOPTERA OF KANSAS, Smith 165
TWO NEW SPECIES OF CARTHASIS, Harris 172
ANOTHER GALL THAT SECRETES HONEYDEW, Weld 175
FOOD PLANT OF CORYTHUCHA MARMORATA, Torre-Bueno 179
NEW SPECIES OF COLEOPTERA, Fall 180
NEW N. AM. SPECIES OF HYDROTEA, Malloch 184
VELIA WATSONI, A NEW RECORD, Torre-Bueno 185
TROPISMS OF PLEA STRIOLA, Clark 186
ERRATA 187

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XX October, 1925 No. 4

STUDIES OF NORTH AMERICAN AEGERIIDAE (LEPIDOPTERA).

By George P. Engelhardt, Brooklyn Museum.

III.

Clematis Root Borers of America North of Mexico.

The genus *Alcathoe* was erected in 1882 by Hy. Edwards (Papilio, Vol. II, p. 53) for the then single known clematis root borer described by Harris in 1839 as *Aegeria caudata* (Am. Journ. Arts and Sciences, Vol. XXXVI, p. 311). This singular moth can be readily distinguished from all others of its family by the long, delicate caudal appendage of the male, which is as long as or longer than the abdomen—a character peculiar to the males of all the species of the genus. Excellent colored figures, including both sexes and the black male variety named "*walkeri*" by Neumoegen, are given in Beutenmueller's *Monograph of the Sesiidae of America North of Mexico* (1901), Plate XXIX, Figs. 7 and 8, and Plate XXXIII, Fig. 11. In this publication Beutenmueller also records from Durango, Colorado, a second species for the genus, namely, *Alcathoe korites* (Druce), originally described and figured as *Sannina korites* from a specimen from Guatemala, C. A. (Biol. Cent. Am., Vol. I, Het., 1884, p. 34, plate V, fig. 22). Druce in his very brief description omits to mention the sex of his type, but judging from the illustration it must have been a male in imperfect condition, lacking the caudal appendage. On the same page and plate he also describes and figures another species—*Sannina verrugo* from Esperanza, Mexico, again omitting the sex. His figure clearly shows that this is a female and most probably that of *S. korites*. He recognizes that the two species have much in common, but he is mistaken in his conjecture that *S. verrugo* is allied to *S. uroceriformis,* the persimmon root borer of North America. Both of his species undoubtedly are clematis root borers and should be placed in the genus *Alcathoe.*

With regard to the form from Colorado, assigned by Beutenmueller to *A. korites,* a handsome series, including both sexes, has come to hand. This indicates a close relationship to that species, but also obvious differences entitling it to specific rank. A specimen in the U. S. National Museum labelled "*S. korites,* Central America," which it has been my privilege to examine, at once stands apart from the Colorado species by the narrowness and more acute angle of its primaries and by its pale yellow antennae. The Colorado species has broader and more rounded primaries and the antennae are orange, dusted with black in the male. Assuming that *S. verrugo* is really the female of *S. korites,* then it also can be separated easily by having black antennae, while in the female of the Colorado species they are orange.

The material before me shows that the genus *Alcathoe,* so far as now known, is represented in North America by three species and one sub-species of which only one—*A. caudata*—has been named. By adding *A. korites* from Central America we have all the members to be placed under the genus. This is a surprisingly poor showing in view of the fact that the foodplant *Clematis* is of such wide distribution, occurring on all the continents, excepting South America, and being represented by something like two hundred species and varieties. Other groups of clear-winged moths, such as the squash borers and grapevine root borers, follow more nearly the distribution of their host plants over different portions of the world and so also it seems reasonable to expect a wider range for the clematis root borers when more careful investigations have been made.

Of our North American species only *A. caudata* appears to be fairly well represented in collections of Lepidoptera and mostly by specimens captured on clematis flowers during July and August. All the species show this preference for the flowers of their foodplant and this method is to be recommended for net collecting. A far more dependable method, however, is that of breeding. Here again a great similarity of larval habits is encountered for all the species. From eggs deposited at or near the crown root of the foodplant the young larvae emerging in late summer tunnel their way into parts of the main root just above or below the soil and feed upon the woody fibres for two or three months, according to climatic conditions, when they hibernate within their burrows to resume feeding during spring and early summer. The change to pupa takes place within an oblong cocoon, constructed of chips and silk in the burrow. The presence of larvae usually is indicated by root swellings in small plants and by ugly scars and distortions of the roots in old plants. Large roots may shelter a dozen or more larvae. Of course, as with all insects boring in living plants, it would be useless to attempt breeding from root cuttings until the time of pupation or near the time of emergence for the moths. However, in advance for collecting, it would be of advantage to locate places of infestation which may be done in the fall, winter or spring. Clearings near human habitations or along roadsides are apt to produce the insects in greater numbers than tangled swamps and dense thickets. The extraction of cocoons without injury to the pupae or the plant involves a difficult and delicate operation, but where it seems permissible to remove root portions, such cuttings are then simply placed in any breeding jar or cage to await the emergence of the moths, generally a matter of two or three weeks. The time to collect pupae and root cuttings of the clematis root borers is late June and early July in temperate zones and March and April for regions with a warmer climate, such as Florida and southern California. A little experience in breeding of this sort should result in fine series of beautiful moths, otherwise looked upon as great rareties.

Key to North American species, sub-species and varieties.

Forewings violaceous; hindwings transparent; antennae and caudal appendage orange .... *caudata.*

Forewings black, hindwings transparent; antennae and caudal appendage black; male varety .... *Walkeri.*

Wings steel blue with a hyaline spot at the anal angle of hindwings; antennae and caudal appendage orange. *carolinensis.*

Wings orange with a hyaline spot at the anal angle of hindwings; antennae orange; caudal appendage black ...... *pepsioides.*

Wings black with a hyaline spot at the anal angle of hindwings; antennae and caudal appendage black .....sub-species *atra.*

Alcathoe caudata (Harris). (*Aegeria caudata* Harris, Am. Journ. Arts and Sciences, Vol. XXXVI, 1839, p. 311.)

This is the well-known clematis root borer, occurring from Canada to Florida and westward to the Mississippi. Transparent hindwings at once separate it from other species of the genus. The moth is not uncommon throughout the New England and Atlantic Coast states during July and August, but in the vicinity of New York City and on Long Island where Joutel and Walker formerly bred specimens in large numbers, so-called " real estate improvements " have nearly quite obliterated the breeding places. Aside from the native food plants—*Clematis virginiana* and *vitalba*—horticultural varieties of clematis occasionally also are attacked. *A. caudata* variety *walkeri* Neumoegen is a black form known only from a few male specimens of which the type is in the Brooklyn Museum, another specimen in the U. S. National Museum and two more in the writer's collection. For one of the latter in superb condition I am indebted to my friend, Ernest L. Bell, of Flushing, L. I., who collected it at Ogdensburg, N. J., on August 27, 1923.

Alcathoe carolinensis n. sp.

Male. Antennae are lacking, excepting a short basal portion which is orange. Palpi black with a few orange hairs in front. Head, thorax and abdomen black with bluish reflections. Caudal appendage bright orange, lateral tufts black. Fore and hind wings black with bluish reflections; the first with a small, narrow, transparent area near base, and the second with a larger and broader transparent area near base, divided by veins A. 1 and A. 2 which are heavily shaded with black. Underside of wings with violaceous reflections. Legs black with the middle tibiae and anterior part of tarsi on hind legs densely clothed with black hair, intermixed inwardly with orange. Alar expanse, 28 mm.

Habitat. Black Mountains, N. C.

Foodplant. Collected by William Beutenmueller on clematis flowers in midsummer.

Types.. Holotype male, American Museum of Natural History.

Described from a unique specimen kindly loaned by Mr. Frank E. Watson, of the American Museum of Natural History. While well within the range of *A. caudata,* the eastern species of clematis root borer, its nearest affinity, nevertheless, lies with *A. pepsioides,* the western species. It is another one of the surprising records of which a number have come from the mountains of North and South Carolina. Additional material is much desired.

Alcathoe pepsioides n. sp.

Male. Antennae orange, more or less obscured by black scales. Palpi black above, orange intermixed with black below. Head, thorax and abdomen black with coppery reflections and a few reddish scales on the patagia and centre of the thoracic disc. Lateral tufts and caudal appendage black. Legs black. Forewings opaque, orange, with the costa, submedian, and median veins lined with black to beyond the cell. Fringes blackish brown. Hindwings, orange with a round hyaline patch at the anal margin, veins partly black. Undersides of wings the same as above, but lacking the black shading on the veins.

Female. Antennae bright orange. No caudal appendage; otherwise like the male.

Alar expanse, male, 26 mm.; female, 28 to 35 mm.

Habitat. Colorado, Utah, New Mexico, Nevada, Arizona, California.

Foodplant. *Clematis ligustrifolia.*

Types. Holotype male and allotype female, U. S. National Museum. Paratypes, American Museum of Natural History, Barnes Collection, G. P. Engelhardt collection.

The series of twelve specimens before me runs uniform with the exception of one male from Fort Wingate, N. M., which has the antennae black above and fuscous below. A female from High Rolls, N. M., has the wings dusky, suggesting a transition to the sub-species *atra* described hereafter. California specimens bear the date of May 31st. Colorado, New Mexico and Arizona specimens July and August. In southern Utah at an elevation of 4,000 feet the species was observed on the wing in late June, while at elevations of from 5,000 to 6,000 feet it was still represented by active larvae in various stages of development in early July. A lot of larvae in root cuttings received from High Rolls, N. M., in late fall wintered successfully in an out-of-door breeding cage filled with soil, only to be devoured by ants at the time of pupation in midsummer. The similarity of the moths to some of the wasps of the genus *Pepsis* is apt to deceive the collector, especially during flight.

Alcathoe pepsioides atra n. sub-sp.

Male. Antenna black above, fuscous below. Head, thorax, abdomen, caudal appendage and legs black. A round hyaline patch at the anal margin of the hindwings. Alar expanse, 29 mm.

Female. Like the male, but lacking the caudal appendage. Alar expanse, 32 mm.

Habitat. Jemez Springs, N. M., 7,000 feet, August.

Types.. Holotype male and allotype female, collection G. P. Engelhardt, Brooklyn Museum. Paratype male, U. S. National Museum.

Described from three specimens collected by J. Woodgate in the mountains near Jemez Springs, N. M., at altitude of 7,000 feet. Other specimens from the same source taken at Fort Wingate at 6,000 feet or less are typical *A. pepsioides* and so also are specimens collected by Prof. F. H. Snow in Oak Creek Canyon, Ariz., at 6,000 feet. This difference of 1,000 feet in elevation throughout the southern part of the Rocky Mountain system is accompanied by important floral and faunal changes, as, for example, the transition from cedar and piñon pine to yellow pine forests. Among insects the effect of altitude frequently is expressed by intensification in coloration and it seems plausible to explain the occurrence of the black form of *A. pepsioides* as due to such causes. The black form "*walkeri*" of *A. caudata,* of which only occasional specimens restricted to the male sex have been found, quite properly has been placed as a "variety." The form *atra* of *A. pepsioides,* on the other hand, occurs in both sexes and as it appears to replace the parent race at high altitudes, it has been given the rank of a sub-species.

ON THE " ANNECTANT BUGS " OF MESSRS. McATEE AND MALLOCH.

By E. Bergroth, Ekenäs, Finland.

In Vol. XIX of this Bulletin, McAtee and Malloch have published a paper under the heading " Some annectant bugs of the superfamily Cimicoideae." This paper requires some comments, lest some tyro in hemipterology may be misled by it.

After reading the pompous and self-sufficient introduction to the paper with all that big talk of the " defects," " errors," " confusion," and " flaws " in the writings of previous authors, one might really expect the quality of the paper to be somewhat different from what it proves to be.

The authors begin with a key to the groups treated in their paper, these " groups " consisting of four units: gen. *Idiotropus* Fieb., gen. *Peritropis* Uhl., gen. *Diphleps* Bergr., and the subfamily Isometopinae. As will be shown below, there are several errors in this key of a few lines. The authors then give a new generic description of what they call *Idiotropus* Fieb. Although the genus has two-segmented tarsi the joint authors assign it to the family Anthocoridae " because of preponderance of the evidence," adding that " if the genus be referred to Microphysidae, it does still more violence to diagnoses of that group." In their descriptions of *Idiotropus* the authors describe the rostrum as three-segmented in spite of the fact that Fieber, the founder of the genus, expressly states that it is four-segmented, and figures it so. The joint authors do not clearly state in what respects their *Idiotropus* does violence to diagnoses of that group and whose diagnoses they have used, but they have apparently stared their eyes out at the three-jointed rostrum. This character is of little consequence, for Schioedte has shown long ago that an anatomical investigation proves the rostrum of all Heteroptera, even those with apparently only three rostral segments, to be four-segmented, although basal segment is more or less shortened or rudimentary in many forms. *Idiotropus* as described by McA. and M. is no more an "annectant bug " or a " connecting link " than the Nabidid genus *Scotomedes* Stål with its apparently three-jointed rostrum is a connecting link between the Nabididae and the Reduviidae. It is in every respect (except the beak) a quite typical Microphysid; to refer it to the Anthocotidae is little short of absurd. The venation of both the fore and the hind wing in the Microphysidae is very characteristic of this family and quite different from that of the Anthocoridae. As the joint authors give a figure of both wings of their *Idiotropus* and of the fore wing of a male *Microphysa tenella,* it is strange that they did not see that these two insects belong to the same family. As to this *Microphysa tenella,* some parts of which are figured on the plate, I suppose it is a new species with this name, but it is not mentioned at all in the text! These figures (18, 19, 20) much resemble the corresponding parts of *Myrmedobia tenella* Zell., but if they are taken from this European species, it remains for the authors to explain the reasons why they have transferred it to the genus *Microphysa.* Of all the literature concerning Anthocoridae and Microphysidae the joint authors seem to have known almost nothing except a small good but antiquated paper by Fieber printed 65 years ago. Had the authors known Reuter's excellent Monographia Anthocoridarum (which also comprises the Microphysidae), or Saunders' Hem. Heteropt. of the British Islands, or the Catalogue of Lethierry and Severin, or that of Oshanin, it would have been clear to them that it is a well known fact since nearly 60 years that *Idiotropus* Fieb. was founded on the males of the genus *Myrmedobia* Baer., which was based on females and of which it thus is a synonym, the males of this genus being macropterous, the females always brachypterous. From the first-mentioned work they would have seen that the genus *Idiotropus* McA. Mall. (nec Fieb.) has all characters of the family Microphysidae as given by Reuter in his monograph, apart from the rostrum which is three-segmented as in another Microphysid genus (*Nabidomorpha* Popp.).

To anyone acquainted with the sexes of *Myrmedobia* Baer. (*Idiotropus* Fieb.) it is clear that *Idiotropus* McA. Mall. is a quite distinct genus for which I propose the name *Mallochiola.* Uhler had correctly designated it in his collection as a new genus, but under a name which it is not desirable to maintain, as it is almost identical with the name of another genus of Hemiptera.

That authors writing anno mundi 1924 and living in a city with excellent libraries proceed to describe a remarkable new insect without consulting the existing monograph of the group it belongs to or other modern works manifests a carelessness almost unprecedented in the writings of American entomologists.

The authors then speak of the genus *Peritropis,* which in their key is said to have two closed cells, although Poppius in his important paper on the Cylapinae (apparently unknown to McA. and M.) states that some species of this genus have only one cell. The authors contend that the grounds for placing *Peritropis* in the Miridae and in the subfam. Cylapinae of that family "indeed could not have been well considered," because the genus has two-jointed tarsi. The observation that the tarsi in *Peritropis* are two-jointed is correct (the fact was overlooked by Poppius), but this is barely a generic character, even if it proves to be constant, and does not prevent it being a typical member of the Cylapinae. In the Pentatomidae there are, apart from the Acanthosominae, some genera of various groups—for instance *Nealeria* Bergr., *Compastes* Stål, *Phalaecus* Stål, *Stirotarsus* Bergr., and *Platytatus* Bergr.—that have two-jointed tarsi. None of the above genera are related *inter se,* nor are they connecting links between the groups they belong to and the Acanthosominae. Likewise we have a few Reduviid genera, for instance *Diarthrotarsus* Bergr. and *Leptolestes* Bergr., with two-jointed tarsi, being however typical Reduviidae and in no way connecting links between this family and some other one having two-jointed tarsi. In the genus *Reduvius* all tarsi are normally three-jointed as in the allied forms, but there is one species with two-jointed hind tarsi and another in which the front tarsi have a single segment. In the Aleocharinae among the Coleoptera we find several *very* closely allied forms with a different number of tarsal joints. Why should not the Miridae occasionally have two-jointed tarsi? In the majority of Miridae the tarsi are constructed in such a way that the apex of the two first joints is as thick as the base of the following joint or nearly so and that it is produced on its underside over the base of the next joint. The tarsal segments are thus practically inflexible and separated from each other not by a true articulation but by a more or less long and always oblique suture, which sometimes is so weak that the use of potassium hydrate is necessary to make it distinctly visible. In a letter to Knight several years ago I called these Mirids leaf-walkers in opposition to the true Mirinae which are straw-climbers with properly articulated flexible tarsi. If in a Mirid tarsus of the inflexible type the suture between two adjacent segments is entirely obliterated, as the case is in *Peritropis,* this is only what might be expected to occasionally occur and is of still less systematic importance than in the Pentatomid and Reduviid genera with two-jointed tarsi. *Peritropis,* therefore, cannot be said to "go far toward bridging the gap between mirid and isometopid forms," it is no more an "annectant bug" or a "connecting link" than *Mallochiola* is. It is a true Mirid and I agree with Poppius that its place is in the subfamily Cylapinae. Writers who, like McAtee and Malloch, feel a calling for systematic reformatory work in Hemiptera will have to use other characters than the number of rostral and tarsal joints, and, above all, should not draw conclusions from a single detached character unsupported by others.

The joint authors give a new description of the genus *Diphleps* Bergr. and their description and figure of the head are very different from the ones given by me. This is due to the fact that in my type-specimen, when still fresh, the head by some accident had been crushed back from in front. Several American hemipterists, who have seen the type, agree in this. As the head also in the injured specimen is quite symmetrical and identical on either side, I was misled as to its real structure. An examination by transmitted light proves the venation of the membrane to be as figured by McA. and M. These authors do not include *Diphleps* in the Isometopidae, because it "resembles *Peritropis,* so much so that the presence of ocelli loses its impressiveness as a primary character segregating mirid from non-mirid forms." This seems to me to be a great exaggeration, and I think that every unbiased hemipterist having a *Diphleps* and a *Peritropis* before him side by side must admit after a careful comparison that the resemblance is only superficial—a parallelism or convergence in certain characters—and that the differences are much more obvious and salient. This does not preclude the probability that the Miridae in a measure are of polyphyletic origin and that *Peritropis* and other Cylapinae descend from one branch of the Isometopidae. As I have remarked in another place, I regard the Mirids of the division Halticaria as more or less directly descendent from certain Isometopidae, but the latter, still largely undescribed, are much more polymorphous than has heretofore been surmised, and after a study of them all it will by and by be clearer from what groups of Isometopidae the different groups of the Miridae have their source. It would be premature here to dilate further upon this subject. I will only set forth that in my opinion it is not *Peritropis* and its allies, but the Bryocorinae that ought to be derived from *Diphleps*-like ancestors. Only among them we find forms with a cuneus similar to that of *Diphleps* and in the venation of the membrane approaching it. I can see no "annectant bug" in *Diphleps*; it belongs to the Isometopidae, although forming a distinct subfamily. In the opinion of the American authors *Teratodia* Bergr. is the male of *Diphleps*. This seems to me highly improbable. My figures (1 and 3) of the pronotum are correct. In *Diphleps* the anterior pronotal angles are projecting in the form of a large interiorly sinuate, exteriorly rounded lobe touching a large part of the eye, in *Teratodia* these angles are only slightly produced, not nearly touching the eye. There is no sexual difference of this kind in any other Isometopid or Mirid. The black median annulation to the second antennal joint, so conspicuous in *Diphleps,* is lacking in *Teratodia.* Unfortunately the type of the latter is the only male of the subfamily Diphlebinae hitherto found. Until *Diphleps* and *Teratodia* have been found *in copulo* or at least together on the same tree, I regard them as distinct.

The Isometopidae are considered only a subfamily by McA. and M., and in the key to the groups they are said to have one closed cell in the membrane, although there are two cells in some genera, the other cell being particularly well developed in *Isometopidea* Popp. The joint authors give a key to eight of the Isometopid genera, but as they in their descriptions of the new genera *Alcecoris* and *Wetmorea* and of *Lidopus* Gibs. have omitted the most important generic characters—the shape and length of the clavus and the presence or absence of a claval commissure—it is impossible to know from the descriptions in what groups of the family these genera should be placed in the systematic arrangement outlined by me (Not. Ent. IV, pp. 4–5). As I happen to know two undescribed species of *Alcecoris,* a genus easily recognized by the unusual structure of the two first antennal joints, I can here state that this genus belongs to the division Myiommaria. Reuter, who well knew both *Myiomma* Put. and *Heidemannia* Uhl., has long ago stated that he had *carefully compared* them, that they are *perfectly identical,* there being *no generic difference,* and that Poppius also had examined them *with the same result.* He also expressly stated that the differences in the structure of the head, which seem to be present in the figures, should be *ascribed to the drawer* and *do not exist* in the specimens themselves. In spite of all these emphatic statements of Reuter, which the authors say they "are not unmindful of," they have not relied on them, but dismiss them with the remarks that the " almost holoptic condition [of *Heidemannia*] is sufficient to distinguish it from *Myiomma* and that they think they "can rely on the figure prepared by Puton." The quoted remarks show how little attention they have paid to Puton's paper, for these figures were not prepared by Puton, who expressly states that they were drawn and painted by Fieber a few days before his death. Also on the plate Fieber is clearly indicated as the drawer. From Fieber's many figures in Reuter's Hem. Gymn. Eur. we know that they, though beautifully drawn and colored, are far from exact, and his figures of *Myiomma,* made when he was old and infirm, are more particularly incorrect. Puton says in his description: "Yeux énormes, occupant tout le dessus de la tête et ne laissant entre eux qu 'un étroit espace rectangulaire." This description ought to have been sufficient to dispel every doubt concerning Reuter's statements, it is correct and also fits *Heidemannia* perfectly, but is totally at variance with Fieber's figures, which represent the interocular space as subequal in width to an eye and the posterior parts of the ocular orbitae as strongly divergent backward. McA. and M. have either not understood the above sentence or (what is more probable) they have not found it worth the trouble to read the description at all. I have carefully compared some specimens of *Myiomma* and *Heidemannia* and can verify Reuter's statements in all points. The interocular space immediately before the ocelli is in *Myiomma* one-fourth the width of an eye, in *Heidemannia* about the same, in front of that place it is just a trifle narrower in *Heidemannia* than in *Myiomma,* the mesoscutum is quite as exposed in *Myiomma* as it is in *Heidemannia* with exactly the same oblique lateral ridges, etc. *M. cixiiforme* Uhl. is closely allied to *M. fieberi* Put., the chief difference being in the sculpture of the corium. The outcome of McAtee's and Malloch's setting-aside of Puton's and Reuter's statements is that their key to the genera breaks down at the start.

It is but fair to add that a few good and correct observations are also to be found in the paper, as might be expected when it is signed by a Malloch, whose excellent achievements in dipterology I am well acquainted with.

THE NEUROPTERA AND MECOPTERA OF KANSAS.[1]

By Roger C. Smith, Kansas State Agricultural College.

Kansas has a good representation of Neuroptera and Mecoptera, and several species among those listed may be appropriately classed as common insects. This list is of especial interest in that it shows a blending of the eastern and western species, and of northern and southern ones.

Several lists of the Kansas species of these two orders have been published, the most important one being Tucker (5).[2]

[2] Numbers in parentheses refer to the bibliography.

Other lists somewhat less complete have been published by Banks (1) and Tucker (4).

The list here given includes those taken by the writer in five summers' collecting in Riley County, those in the collection of the Department of Entomology of the Kansas State Agricultural College, and those in the collection of Kansas University supplied through the courtesy of Professors S. J. Hunter and H. B. Hungerford. A list of the identified specimens of these orders now in the Kansas University collection was furnished the writer also with the locality and name of the identifier. Parts of these data have been included in this paper in an effort to make the list as nearly complete as is possible at this time.

Specimens of nearly all of the species listed have been sent to Dr. Nathan Banks for determination or verification, and the writer is pleased to acknowledge this valuable and authoritative assistance. Species marked with an asterisk (*) were verified by Dr. Banks, otherwise, unless credited to him or to someone else, the specimens were identified by the writer. Where no collector is named, the specimens were usually collected by the writer. The names of collectors have been given except where the species is rather common and many specimens have been taken.

In the listing of species, Comstock's classification as to families has been followed.

---

[1] Contribution No. 346 from the Entomological Laboratory, Kansas State Agricultural College. This paper embodies some of the results obtained in the prosecution of State Project No. 115 of the Agricultural Experiment Station.

NEUROPTERA.

SIALIDAE.

Corydalis cornuta Linn. (5). Many specimens in collections; June 26 to Aug. 3, taken chiefly at lights; much variation in size, 60–80 mm. in length. Larvae plentiful in Wild Cat creek, Riley County.

Chauliodes serricornis Say. One specimen in K. S. A. C. collection, taken by Elmer Cheatum along Walnut river, Winfield, Kansas, July 18.

Chauliodes rastricornis Ramb. (5). Douglas County. Not seen by the writer.

Sialis infumata Newm. Det. J. G. Needham. Three specimens from Riley County, April 2–May 11, collected by F. E. Whitehead. An uncommon species at Manhattan. Eight specimens in K. U. collection, Douglas Co., April 14, Robert Guntert collector.

RAPHIDIIDAE.

None seen nor reported from this state.

MANTISPIDAE.

Mantispa brunnea Say.* Rare. Specimens from Riley Co., June 8–Sept. 1, collected by G. A. Dean and E. A. Popenoe. Specimens in the K. U. collection from Douglas, Allen, Chautauqua, Anderson and Neosho Counties. Collected by R. H. Beamer and others.

Mantispa interrupta Banks. Identified by Banks. Very rare. Three specimens; Riley Co., May 28, Popenoe; Dean, Riley Co., Aug. 10, and one taken by a member of a class on a field trip, Aug. 16, 1922, while beating oak trees along Wild Cat Creek, Riley Co. Five specimens in K. U. collection from Osage and Lyon Counties, R. H. Beamer collector; and from Burr Oak, Kans., J. N. Smith collector.

Mantispa sayi Say. Identified by Banks. A single specimen in the K. U. collection taken by R. H. Beamer, Lyons Co., Kansas, June 8.

SISYRIIDAE.

Sisyra vicaria Walk. Reported (5) from Hodgman County.

SYMPHEROBIIDAE

Sympherobius barberi Banks. Identified by Banks. Many specimens taken by beating oaks along Wild Cat Creek, June

12, July 7, and Oct. 14. Eggs were obtained, and three larvae reared.

Sympherobius amiculus Fitch (5). One specimen, Riley Co., June 12, taken with the above species. Reported from Douglas Co. (4), and there is a specimen determined by Banks in the K. U. collection from Douglas Co. Reared (3).

Sympherobius sparsus Banks. Identified by Banks. In K. U. collection from Douglas Co.

Sympherobius perpavus McLach. Reported by Tucker (6) from Douglas Co.

HEMEROBIIDAE.

Hemerobius stigmaterus Fitch (5). Identified by Banks. Our most common Hemerobiid. Taken by beating pines, April 7 to June 17, by sweeping alfalfa April 14 to Dec. Reported (5) from Douglas Co. One specimen from Norton Co. collected Aug. 5, by F. X. Williams, is in the K. U. collection. Of some value in aphid control. Reared (3).

Hemerobius humili Linn.* (3). Three specimens, June 27 (2) and Sept. 8. An eastern species and very rare here. Two specimens from Douglas Co. taken by C. P. Alexander and R. H. Beamer are in the K. U. collection.

Micromus posticus Walk.* (3). Five specimens, Mar. 5, Oct. 10, and June 22, 1922. One specimen in K. U. collection. Montgomery Co. Occurs in alfalfa fields and on trees. Reared (3).

Micromus variolosus Hag.* Many specimens taken by sweeping alfalfa, June 20, Sept. 8 and 17, on the college farm at Manhattan. Many specimens also taken by Edgar Davis in thermographs in an alfalfa field during the fall and winter of 1924, where they overwintered as adults.

BEROTHIDAE.

Lomamyia flavicornis Walker* (3). Two specimens, June 16 and 18, a male and a female collected by beating lower branches of an oak tree along Wild Cat creek; an exceedingly rare species. An eastern form at perhaps its western limit.

POLYSTOECHOTIDAE.

Polystoechotes punctatus Fab. (1). One specimen in the K. U. collection taken by F. X. Williams in Greeley Co. A northern species and exceedingly rare here.

CHRYSOPIDAE (2).

Chrysopa oculata Say (5). Fairly plentiful during July, August, and September; ranks second in numbers of the Chrysopids. Most frequently taken on elms, in gardens, especially melon patches, alfalfa fields and corn fields. Wings of this species appear to average slightly darker than eastern specimens. K. S. A. C. specimens from Riley Co. K. U. specimens from Miami, Montgomery, Johnson, Bourbon, Chautauqua, Russell, Douglas, Sedgwick and Clark Counties. Probably all over the state.

Chrysopa nigricornis Burm. (1). Fairly common during July, Aug. and Sept. on trees, vegetation, under trees and on underbrush. K. S. A. C. specimens from Riley and Edwards Counties; appear to be slightly lighter than eastern specimens. K. U. specimens from Gray and Rush Counties. Others determined by Banks from Chautauqua, Rawlins and Douglas Counties.

Chrysopa rufilabris Burm. (5). Somewhat less common than the above species. Specimens in K. S. A. C. collection, Riley County, from July 7 to Oct. 4. Occurs on *Spiraea*, sorghum, alfalfa, and on various trees, especially fruit trees. Specimens in K. U. collection from Douglas and Clark Counties. Others identified by Banks from Douglas, Miami, Russell and Johnson Counties.

Chrysopa quadripunctata Burm. About as common as *C. nigricornis* and occurs in the same habitats, June to August. Larvae sometimes found feeding on woolly apple aphids on elm and apple, and on various Cicadellid nymphs. Specimens in K. S. A. C. collection from Riley and Kiowa Counties.

Chrysopa cockerelli Banks.* The most interesting of Kansas species. Larvae are true trash carriers; occur on various trees, especially oaks, maples and lindens, where they may be found crawling around on the trunks or limbs, June to Oct. Overwinters as larvae. Adults rare, taken once by beating willows. Dr. Hungerford stated that trash carriers presumably of this species occurred at Lawrence, Douglas County.

Chrysopa plorabunda Fitch (1). The state's most common and abundant Neuropteron. Present during the entire year, as it overwinters in the adult stage. Common in alfalfa, sorghum, corn and on other field crops, also on various trees and shrubs. Valuable enemy of various aphids, especially on alfalfa, sorghum, corn and apple. Overwintering adults are of both sexes; become greatly discolored in fall, dull brownish or reddish-brown, but regain their normal green coloration in spring, after taking food, especially water.

Chrysopa sabulosa Banks (4). A specimen in the K. U. collection from Wallace County, collected by F. X. Williams.

Chrysopa harrisii Fitch. One specimen, June 23. A northern species and very rare in Kansas; on evergreens. A single specimen is in the K. U. collection from Saline Co., July 3. L. C Woodruff collector.

Eremochrysa punctinervis McLach.* One specimen, April 28, taken at Manhattan by beating arbor vitae or pine trees in the cemetery. The specimen is unusual in that the third cubital cell is divided as in *Nothochrysa.* A southwestern species which is very rare here. Two specimens in the K. U. collection—one collected by F. X. Williams in Thomas County, and the other from Barton County.

Eremochrysa fraterna Banks.* Specimens of this species are in the K. U. collection, determined by Banks, from Wallace, Finney, and Hamilton Counties. Three specimens taken on weeds bordering a sorghum field at Manhattan, July 3, 1925. Reared; larva a trash carrier. A western species and rare in Kansas.

MYRMELEONIDAE.

Dendroleon obsoletum Say.* Fairly plentiful at Manhattan, during July and August, occurs also April to September. Larvae collected several times and reared. Overwinters in the cocoon. Specimens in K. U. collection from Chautauqua and Douglas Counties.

Brachynemurus abdominalis Say* (1). The state's most common ant lion, fairly plentiful in alfalfa fields. Numerous specimens in K. S. A. C. collection, June 16 to September 18, and also in the K. U. collection. A weak flier and readily collected; probably all over the state.

Brachynemurus nigrilabris Hag.* (4). Eight specimens collected by F. X. Williams in the K. U. collection from Seward County. One specimen in K. S. A. C. collection from Riley County.

Brachynemurus hubbardi Currie* (4). Eleven specimens in the K. U. collection from Clark, Seward, Stafford, Gray, McPherson, and Pawnee Counties; also specimens determined by Banks from Clark, Seward, Norton, and Finney Counties.

Brachynemurus texanus Banks. A specimen identified by Banks is in the K. U. collection from Clark County.

Brachynemurus irregularis Currie. Identified by Banks. Two specimens in the K. U. collection from Clark County collected by F. N. Snow. Three specimens in K. S. A. C. collection. July 16, taken at the sand dunes in Riley County.

Brachynemurus blandus Hag. A specimen determined by Banks is in the K. U. collection from Hamilton County.

Brachynemurus texanus Banks. A specimen from Clark County determined by Banks is in the K. U. collection.

Myrmeleon immaculatus DeGeer. Two specimens identified by Banks in the K. U. collection from Gray County, July 9–15, and the other collected by W. J. Brown, July 16, in Douglas County. Three specimens in K. S. A. C. collection from Riley County. One September 20, collected by Norton, and the other two, July 2 and 14, by the writer.

Psammoleon guttipes Banks. Three specimens identified by Banks in the K. S. A. C. collection from Russell and Riley Counties. The former were taken June 20, the latter is undated. Three specimens in the K. U. collection taken in July from Douglas, Gray and Hamilton Counties.

Hesperoleon abdominalis Say. Identified by Banks. A single specimen in the K. S. A. C. collection without date or locality label. Two specimens in K. U. collection from Greenwood County, July 31 and September 2.

Cryptoleon signata Hag. Identified by Banks. Several specimens collected at the sand dunes, Riley County, Kansas, during July.

ASCALAPHIDAE.

Ululodes macleayana Hag. (*hyalina* Latr.) (1). One specimen identified by Banks in the K. S. A. C. collection, taken by J. B. Norton, Riley County, July 18. Three specimens in the K. U. collection from Cowley, Douglas and Chautauqua Counties, collected by R. H. Beamer. Previously reported from Douglas County.

Colobopterus excisus Hag. A single specimen of this unusual and exceedingly rare insect in the K. S. A. C. collection taken by some student in south-central Kansas, undated. One specimen determined by Kahl in the K. U. collection.

CONIOPTERYGIDAE.

Coniopteryx vicina Hagen. Reported (5) from Douglas County, Kansas. Determined by Banks. One specimen taken in the home of the writer on a table under a light, May 29, 1925.

MECOPTERA.

PANORPIDAE.

Panorpa nuptialis Gerst. A single specimen of this striking species in the K. S. A. C. collection; taken at Baxter Springs, Cherokee County, July 9, by W. R. Ballard. Two specimens in the K. U. collection from the same county.

Panorpa confusa Westwood.* A long series in the K. U. collection from Leavenworth County, June 28. Collected by R. H. Beamer.

BITTACUSIDAE.

Bittacus stigmaterus Say (1). Fairly common in the alfalfa fields and some woods, July to September. Many specimens from Riley County in K. S. A. C. collection. Specimens in K. U. collection from Montgomery County, taken by R. H. Beamer. Also specimens identified by Banks from Douglas, Smith, Rooks and Osborne Counties.

Bittacus strigosus Hag.* (1). Fairly common in alfalfa fields in Riley County from early August to late September. Many specimens from Riley and Washington Counties in the K. S. A. C. collection. Specimens in K. U. collection from Montgomery, Leavenworth, Gray, and Chautauqua Counties. Previously reported from Douglas County.

Bittacus occidentis Walk.* Occurs with the two preceding ones, but is less common. Specimens in K. S. A. C. collection taken in July and September, Riley and Cowley Counties. Specimens from McPherson, Kiowa, Saline, Rice, Greenwood, Waubaunsee, and Douglas Counties are in the K. U. collection.

Bibliography.

1. **Banks, Nathan.** On a collection of Neuropteroid Insects from Kansas. Ent. News, 1894, 5: 178–180.
2. **Smith, Roger C.** The Biology of the Chrysopidae. Cornell Univ. Agri. Exp. Sta. Memoir. 58: 1285–1372, 1922, figs. 154–163, plates 75–87.
3. **Smith, Roger C.** The Life Histories of Some Hemerobiids and Allied Species. Annals Ent. Soc. Amer., 1923. 16: 129–148, 3 pls.
4. **Tucker, Elbert S.** Some Results of Desultory Collecting of Insects in Kansas and Colorado. Kan. Univ. Sci. Bul., 1907. 4: 51–108. (Ref. on p. 80–81.)
5. **Tucker, Elbert S.** Contributions Towards a Catalogue of the Insects of Kansas. Trans. Kans. Acad. Sci., 1907. 20 (pt. 2): 190–201. (A preliminary list of the Neuropterous Insects of Kansas, 194–196.)

TWO NEW SPECIES OF CARTHASIS (HEMIPTERA, NABIDAE).[1]

By Halbert M. Harris, Ames, Iowa.

Carthasis gracilis n. sp.

Elongate, flavo-testaceous, marked with reddish. Head flavo-testaceous to rufescent, transversely grooved between eyes, the part anterior to groove shiny and sparsely pubescent, that posterior to groove rugulose and non-pubescent. Gula with four prominent seta-like spines. Eyes large, red, coarsely granular. First antennal segment clothed with a few scattered fine hairs, its length equal to or slightly less than that of pronotum. Rostral segment I as broad as long, faintly tinged with red; II slightly longer than pre-ocular part of head; III one-third shorter than II; IV one-fifth shorter than III; II and III beset with a few long, fine hairs.

Pronotum with the broad, median, reddish to dusky stripe greatly and angularly widened and also tending to become more dusky on posterior lobe. Scutellum brownish, tinged with red. Hemielytra smooth, shiny, strongly constricted at about the basal one-fourth; costal margin before the constriction with a few long hairs; a broad stripe on clavus bordering the scutellum rufous to fuscous; a marginal and a sub-marginal streak on claval commissure and an interrupted streak along inner margin of corium extending posteriorly and expanding at the inner angle and before the apex into two irregular patches, crimson. Membrane fuscous with a large area opposite apex of corium lighter, its apex reaching slightly beyond tip of abdomen. Legs flavo-testaceous; anterior femora armed beneath with short teeth interspersed with a few long spines and with long, bristle-like setae.

Venter pale stramineous, smooth, shiny, beset with a few long hairs. Genital segment large, pubescent, more or less fuscous. Clasper with very short stem and a more or less circular blade that forks at its apex into an upward and a downward projecting hook. Length 3.3–3.5 mm.; width .55 mm.

Holotype: Male, El Fraile, P. de Guanahacabibes, Cuba, April 6, 1924, S. C. Bruner collector. *Paratype:* Cape San Antonio, Cuba, April 13, 1924, S. C. Bruner collector.

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College.

Carthasis distinctus n. sp.

Sub-elongate, testaceous to flavo-testaceous, marked with reddish. Head rufescent above, darker posterior to the inter-ocular groove, finely pubescent. Gula provided with four prominent seta-like spines. Eyes large, red, coarsely granular. Antennae testaceous, thickly pubescent; segment I thick, distinctly shorter than pronotum, II one-fourth longer than I, III equal to I, IV two-thirds longer than III. Rostrum testaceous; segment I reddish, as broad as long; II and head before eyes sub-equal in length; III one-third shorter than II; IV slightly shorter than III, piceous at the tip; II and III beset with a few long, fine hairs.

Pronotum strongly constricted behind the middle, with wide apical collar, testaceous to flavo-testaceous with two more or less broad stripes on either side of median line (sometimes converging anteriorly) red. Scutellum reddish brown to dark fuscous, the apex lighter. Hemielytra reaching slightly beyond tip of abdomen, moderately constricted before the middle, costal margin before the constriction with a few scattered, short, fine hairs. Clavus rufous, the outer margin lighter; corium flavo-testaceous, a large patch extending along inner angle and on to membrane fuliginous to fuscous, a patch near the middle and a similar one near the apex connected by an interrupted streak along the inner margin crimson. Membrane without distinct veins, smoky brown with lighter margin. Legs testaceous; anterior femora short, thick, slightly darkened before apex, armed beneath with short teeth, interspersed with a few longer spines and slender bristle-like setae; anterior tibiae armed within with slender spines. Venter flavo-testaceous, sparsely pubescent, provided with a few, long, slender hairs. Length 3.5–4 mm.; width .66–.82 mm.

Male: Smaller. Abdomen reddish above on apical one-third, produced into short, backward and downward projecting, circular flaps on the third, fourth and fifth visible ventral segments. Genital segments prominent; clasper large, distinctive.

Female: Slightly larger and more robust. Genital segments large, ovipositor prominent.

Holotype: Male, Santiago de las Vegas, Cuba, Dec. 26, 1922, S. C. Bruner collector. *Allotype:* Female, Santiago de las Vegas, Cuba, Sept. 19, 1923, S. C. Bruner collector. *Paratypes:* Female, Santiago de las Vegas, Cuba, Sept. 5, 1923, S. C. Bruner collector, and Palmira, Cuba, Aug. 20, 1924, C. H. Ballou collector.

The above two species can be readily separated from each other by the more slender form and the median longitudinal reddish pronotal stripe of *gracilis,* and moreover by the large clasper of *distinctus.* This clasper is very distinctive, reminding one of the clasper of a *Nabis,* and will separate the species at once from all other known species of *Carthasis.*

C. distinctus shows slight color variation, particularly as to the amount of red on the scutellum. Both species have been confused in collections with *C. rufonotatus* Champion and *C. minor* Reuter but are easily separated from either of these, *distinctus* by the shape of the male clasper, *gracilis* by its more slender, elongate form. Through the kindness of Mr. E. P. Van Duzee and Dr. C. J. Drake, the writer has been able to examine a topotypical specimen of *C. minor* Reuter. *C. minor* is quite distinct, and is not synonymous with *C. rufonotatus* Champ. as suggested by Barber, Jour. N. Y. Ent. Soc., XXIV, 1916, p. 308. According to Mr. W. E. China, of the British Museum, who has kindly compared specimens of *C. decoratus* Uhler (= *C. contrarius* Reut.) from Mississippi with Champion's types, *C. decoratus* Uhler, while very closely related to *C. rufonotatus* Champion, is nevertheless specifically distinct.

ANOTHER GALL THAT SECRETES HONEYDEW.

By Lewis H. Weld, Bureau of Entomology, U. S. Department of Agriculture.

In his paper on "Galls that secrete honeydew," in the October, 1924, number of the Bulletin, Dr. Bequaert mentions no case either in America or Europe in which such a secretion is of any particular economic interest. Dr. E. F. Phillips, of Cornell University, to whom I am indebted for much information, writes that "in the beekeeping literature there are a number of records (see Am. Bee Jour., 63: 561) of galls furnishing such secretions, but these records seem to be much like those in the entomological literature, merely records of fact without discussion of importance."

Just recently Mr. H. J. Clay, of the Bureau of Agricultural Economics, has brought to my attention an instance that seems to be of sufficient interest to be recorded. A volunteer collaborator in his department, Mr. A. W. Gambs, a beekeeper at Cottonwood, Shasta Co., California, had sent in for determination some immature oak galls with the statement that they secrete honeydew in such quantities in the fall that his bees store up 30 to 40 pounds of honey per hive from this source. Further correspondence resulted in another collection of galls on December 7, some weeks after the fall rains had begun, but by this time the galls had matured and the adults had emerged. The galls seem to be those of *Disholcaspis eldoradensis* Beut. and are produced on twigs of *Quercus lobata* Nee, known locally as the "river bottom" oak. The galls are somewhat depressed and slightly elongated bullets in clusters along the twigs. They have burst out of cracks in the bark along the internodes, remaining broadly attached, the lower half tan-colored and somewhat polished, the upper darker and deeply fissured, and it is this rugose surface which secretes honeydew during the early stages in the growth of the gall.

Mr. Gambs writes: "These galls are much more plentiful in a season following a mild winter or a dry summer than other seasons. They are on the new growth of wood. They show up here August 10 to 20, growing slowly at first, then when the larva gets a start the gall puffs up, in two or three days breaks through the bark and will yield for several days. Then another will come on the same twig farther out, and so on. The yield continues until the early rains late in October or November. The galls do not occur on all trees, but one large tree to my personal knowledge has yielded for eleven years, while other trees on the same soil and at the same distance from the river, so that subirrigation would be the same, do not yield at all. The flow is best when the season is driest. In a wet season, when the late honey flow is on from the star thistle and blue curl, only now and then will a colony of bees work on oaks. The yield was so heavy this year that there were not half enough bees to care for it. Whole trees would look greasy, and when dry the leaves would look slick, the edges white when broken. I have never noticed any yield of honeydew from galls on the leaves of oaks, but we get some honeydew honey from a plant louse on the leaves of a live oak.

" The economic value of honeydew from this source is that it comes so late in the fall as November 1, and this encourages the bees to raise large quantities of late brood and leaves our bees here in the best of condition for early queen-rasing and to supply package bees to northern beekeepers to make up their winter losses. As this is the most northern point in California where early queens and bees can be raised, honey from this source is as good as better quality honey for bee feed. It is much better for winter stores than honeydew honey from aphids on willows farther south."

Mr. Gambs has a bee range 70 miles south, in star thistle pasture, whose honey flow begins late in July and is over in September. This star thistle honey can all be put on the market and his bees then have all of late September and October to accumulate winter stores from the oak galls, while other bees not so favorably situated have little to work on in October. As his climate is such that his bees are never more than 10 days without a flight in winter, he is able to winter successfully on this bee food, and in recent years finds it more profitable to utilize these unique local conditions to produce queens and package bees, for which the market is good in March, April and May, rather than to run for spring honey. The prolonged late flow not only favors the rearing of brood but enables the bees properly to prepare their " winter nest " inside the hive for the outdoor wintering.

The sample comb of honey made from these oak galls is lighter in color than aphid honeydew honeys, and Mr. Wm. F. Kunke, of the Bureau of Chemistry, finds that it contains 18 per cent. moisture, 0.42 per cent. ash, and gives a levorotatory polariscope reading of — 15.2, allying it with the true floral product rather than with the dextrorotatory honeys produced from the honeydew of aphids.

The writer has seen these immature galls secreting honeydew on August 15 at Placerville on this same species of oak, and noted the mature galls on this oak at Newhall, Ojai, Lebec, Visalia, Kaweah, Stockton, Santa Margarita, Paso Robles, Los Gatos, Palo Alto, Santa Rosa, St. Helena, Calistoga, Ukiah, Bartlett Springs, Lakeport, Chico and Red Bluff.

A similar but undescribed twig gall was observed by the writer on the scrub Kaweah oak in Sequoia National Park, just above Cedar Creek checking station on the road to Giant Forest. These galls were just bursting out through the bark on September 8, 1922, forming clusters for several inches along the twigs and secreting honeydew so copiously that it dripped down the stem and on to the leaves and ground below, and in the hot sun it became very sticky, as did one's hands in gathering a quantity of the galls for rearing. On the preserved galls some of it evaporated down to a hard white amorphous solid which gave a dextrorotatory polariscope reading and a calculated dextrose sugar content of 45 per cent. When tested with Fehling's solution it gave no characteristic reduction, confirming the single test reported by Dr. Bequaert. Mr. Kunke adds, however, that " on heating, considerable free ammonia was given off, indicating that an ammonium compound is present in appreciable amount." The significance of this is not clear unless some protein of plant or animal origin was included in the sample.

Among beekeepers at least, the term " honeydew " is applied to sweetish material from two sources, namely, the excretion of certain Hemiptera such as scale insects, leaf hoppers and aphids, and the exudations from the extra-floral nectaries of plants, the latter being the less common.

Aphid honeydews yield a honey characterized by right-handed polarization, deficiency in invert sugar, abnormally high ash content, and a high proportion of gums and resins which make it dark in color. It yields more waste material than any other bee food, and as this waste can be voided from the intestine only when bees are in flight such food is suitable for wintering only in a mild region where the weather is such that bees can fly at least once in every two or three weeks. On such food, if the winters are severe or where no flight is possible for six weeks or two months, bees perish of dysentery. The bad effects of such winter stores seem to be well understood by beekeepers. Mr. Gambs writes that they get some late honeydew honey from a plant louse on willows. Still, when frequent flights are possible bees can be wintered successfully on it, for Dr. Phillips says that " in the San Joaquin valley there are a number of beekeepers who regularly move their bees to the swampy lands each fall to enable them to fill up on insect honeydew for winter." This honeydew is secreted mostly in the daytime, nearly ceasing at night. Such secretions of aphids often drip from the trees to walks and ground, and in unusual seasons furnish enough material to keep bees busy for weeks. In Hawaii large quantities of honey are produced from the honeydew of insects on sugar cane, and as it is dextrorotatory it does not conform to the U. S. food standards and can not be sold as honey. It is imported by the carload and used by bakers in the production of honey wafers and candy, retaining moisture and the honey flavor after cooking better than does pure honey.

Extra-floral nectaries are normal structures on many plants. Bonnier determined that their exudations occurred mostly at night, reaching a maximum at sunrise, the favoring conditions being darkness, increased humidity and cool nights alternating with hot dry days. They are far less abundant in tropical and temperate climates than they are in higher latitudes, and at high altitudes many plants excrete freely from their leaves when the same species furnishes no such secretion nearer sea level. As an example of the last statement Dr. Phillips cites the case of the " quaking aspen which at high altitudes secretes abundantly from one to three glands on the leaves, so that sometimes the secretion is so abundant as to soak one to the skin in going through a tract covered by this species." Cotton has extra-floral nectaries both on the involucral bracts and on the under side of the leaves, the latter being most active when the leaf reaches maturity and prolonging the honey flow from July until after the first frosts.

Few analyses of secretions from extra-floral nectaries are available, but they are said to be higher in ash and in dextrins than most floral nectars. In them Bonnier found also cane sugar, mannite, glucose, gums and tannin, and although they vary much in different plants he concludes that in a general way these plant honeydews are different from the honeydews of aphid origin, their composition being more like that of floral nectar.

The honey-producing glands on galls seem to consist histologically of tissues produced normally on other parts of the plant and here called into being by the plant in response to the stimulus of the gall-maker. They might be called artificial extra-floral nectaries, and, although on an abnormal plant structure, their secretion is a pure plant product. How closely allied chemically it is to the nectar or the secretion of other extra-floral nectaries on the same plant we do not know, for no chemical work other than the two tests with Fehling's solution mentioned above seems to have been done.

In spite of its high ash content this honey, being levorotatory, is closely allied to the true honeys and much better in quality than the aphid honeydew honeys. It seems unfortunate that the term honeydew has been applied to the extra-floral excretions of plants as well as to the apparently similar excretions of insects, which are quite different chemically, and the resulting honeys from which are quite different.

Food plant of Corythucha marmorata Uhler. This species is frequently found on the underside of the basal leaves, near the ground, of a species of golden rod (*Solidago*), growing by roadsides. They are to be seen there in great numbers in all stages, the leaves being much bleached by their activities. This is noted by Parshley in *Hemiptera of Connecticut,* p. 702. This species and *C. ciliata* Say are locally the most abundant of the genus about White Plains.—J. R. de la Torre-Bueno, White Plains, N. Y.

NEW SPECIES OF COLEOPTERA OR RECENT DISCOVERY.

By H. C. Fall, Tyngsboro, Mass.

The following four interesting new species may be clearly defined apart from monographic treatment, of which indeed there is little likelihood for some time to come.

Ischiodontus granosus n. sp.

Moderately elongate, subfusiform, brown, conspicuously clothed with semi-erect yellowish brown pubescence. Antennae (♂) 2/5 as long as the body, of the form prevailing in our other species of the genus, the 2d joint small, about half the length and half the width of the 3d, the latter a little longer than wide, joints 4–10 subequal in length and gradually decreasing in width. Head densely punctate, broadly impressed anteriorly, clypeal margin arcuate. Prothorax slightly wider than long, gradually narrowed from about the basal 2/5, hind angles prolonged, acute, feebly divergent; punctuation rather coarse and dense, becoming finer postero-medially where the punctures are separated by their own diameters or more. The median line is not visibly sulcate, but there is on each side a distinct suboblique impression a little before the base and at about the lateral fourth; hind angles carinate, surface everywhere polished between the punctures. Elytra about 2 1/3 times as long as wide, striae distinctly impressed, moderately punctate, intervals rather densely granulate punctate, the punctures occupying the summits of rounded granules, which as a rule are somewhat more elevated in front. Body beneath shining, pubescent, rather finely not closely punctate, the flanks of the prothorax especially so except along their outer margin; last ventral densely punctate apically.

Length 6.5–7.3 mm.; width 1.85–2.25 mm.

Described from two male examples (including type) taken by myself from beneath cover on the sand above the beach at Palm Beach, Florida, April 10, 1925, and a single specimen received from Mr. Blatchley who took it on the Gulf shore of Hog Island opposite Dunedin on the west coast, April 18, 1925.

This species is at once easily separable from our other species of the genus by its granose elytral interspaces which give the elytra a dull scabrous aspect.

Fornax rugicollis n. sp.

> Elongate, subcylindrical, brown, clothed sparsely with short decumbent pubescence. Antennae (♂) a little longer than the head and thorax, 2d joint 1/3 as long as the 3d, the latter a little longer than the 4th, joints 4–8 serriform, the 8th very feebly so. Head convex, very densely, coarsely, variolate punctate. Prothorax ¼ wider than the length on the median line, very slightly narrowed toward the front, sides nearly straight, hind angles produced and acute; disk broadly convex, a punctiform impression each side of the median line just before the middle; surface very densely, coarsely punctate and dull. Elytra 2½ times as long as wide, nearly parallel in basal half but with the width measurably greater at middle than at base, gradually narrowed behind the middle; striae lightly impressed, intervals rather finely asperately punctate and moderately shining. Body beneath finely pubescent and moderately shining; prosternum with rather sparse and coarse simple punctures, propleura densely coarsely punctate, metasternum with moderately dense asperate or muricate punctures, abdomen more finely punctured; apex of last ventral narrowly rounded. Length 7.5 mm.; width 2.3 mm.

Described from a single male specimen taken at Hope, Arkansas, by Miss Louise Knobel.

By the characters of Horn's table (Trans. Am. Ent. Soc. 1886, p. 24) this species falls with *orchesides* and *molestus,* differing from them signally in its much smaller size, cylindrical form, and rugose punctuation of the thorax. The secondary male characters consist of the short erect pilosity on the lower side of the antennal joints, and the comb of short black spinules on the under surface of the basal joint of the protarsi. This last character I think has not before been announced. Its discovery is due to the keen observation of my lamented friend Frederick Blanchard, who noted its presence in several species of *Fornax* and thought it not unlikely that it might occur in all of them.

Agrilus transimpressus n. sp.

> Form, size and color virtually as in *otiosus,* with which and allies it must be associated by the structure of the antennae and tarsal claws, and the completely armed tibiae in the male. In the series at hand the males have the head, antennae and sides of the thorax blue or blue green, the front

flatly convex and albopubescent; in the female the corresponding parts are more or less bronzed. The median line of the front is feebly impressed in both sexes, the occiput slightly strigose. The prothorax is strongly transversely strigose, the carina of the hind angles variable in development but as a rule rather feeble and obtuse. Elytra, antennae, legs and body beneath (except secondary sexual characters) nearly as in *otiosus.* In the male the median line of the body is not conspicuously pubescent, scarcely more so than in the female; the first ventral broadly longitudinally impressed, the second broadly rather strongly transversely sulcate or concave as viewed from the side.

Length 4.5–5.3 mm.

Described from a good series of specimens of both sexes sent me by Miss Louise Knobel, who took them at Hope, Ark., on a green shoot of a decrepit black walnut (*Juglans nigra*), April, 1925. It is not unlikely that this species will be found in collections mixed with *otiosus,* in which case the strongly transversely impressed 2d ventral of the male (a unique character in the genus so far as I know) will make its recognition easy.

In Entomological News, 1920, p. 10, Mr. Knull gives a table for separation of the males of the eastern species of the *otiosus* group. In this table the present species will be associated with *juglandis* and *frosti,* both of which have the basal two segments of the abdomen longitudinally grooved in the usual manner. In *transimpressus* the genital sheath is parallel sided apically, the sides of the flattened penis sinuate before the finely acute tip.

Mr. Knull, on p. 8 of the above reference, states that in the female of *juglandis* " only the anterior and middle tibiae are mucronate." It would be remarkable if this were the case, but there must be some mistake here. In a series of *juglandis* sent me some time ago by Mr. Knull himself, the tibiae in the female are all unarmed at tip.

Ibidion polingi n. sp.

Elongate, parallel, brown, shining, elytra each with a narrow somewhat irregular (zigzag) yellow fascia, extending obliquely outward and backward from the suture at about the basal third, sometimes attaining the side margin but more often not, the fascia rarely entirely wanting. Upper surface sparsely clothed with fine short recumbent pale pubescence, the elytra also each with three series of longer erect hairs

> springing from coarser punctures; the thorax, legs and lower side of the antennae in basal half sparsely bristling with similar erect hairs. Antennae slender, just passing the elytral apex in the female, in the male somewhat stouter and passing the elytral apex by about three and one-half joints. Head rather densely subrugosely punctate. Prothorax cylindrical, two-thirds longer than wide, transversely impressed near base and apex, disk with three tuberculiform elevations forming a transverse triangle, the one on the median line at about the middle of the length and a little behind the other two; there are also two other faintly indicated tubercles before the posterior transverse impression; punctuation fine and sparse. Elytra nearly three times as long and two-thirds wider than the prothorax, and almost three times as long as wide; humeri rectangular with rounded angles; inner margins slightly diverging at the sutural angles, the apices either rounded or feebly subtruncate. Body beneath nearly smooth with very fine, sparse, recumbent pubescence; last ventral broadly subangulate at tip in the female, narrowly subtruncate in the male. Thighs moderately clavate, the anterior ones a little stouter. Length 10–12 mm.; width 2.25–2.8 mm.

Described from a series of eight specimens, all taken by Mr. O. C. Poling in the Baboquivari Mts., Arizona. The type is a female in the writer's collection; a paratype has been sent to the National Museum Collection.

This is a less slender insect than either *exclamationis* or *townsendi* and quite differently marked.

A NEW NORTH AMERICAN SPECIES OF HYDROTAEA (DIPTERA).

By J. R. Malloch, Washington, D. C.

The larval habits of most of the species of the anthomyid genus *Hydrotaea* are unknown, but practically all of those that are known feed in manure. The present species is a notable exception though it probably feeds upon detritus in the nests where the larvae occur.

Hydrotaea nidicola n. sp.

Male and female.—Shining black. Face whitish dusted; inter frontalia of female red-brown; orbits in both sexes glossy black. Thorax very faintly pruinescent, not noticeably vittate. Abdomen of female entirely glossy black, of male gray pruinescent on dorsum and with a very faint black central line basally. Wings hyaline. Calyptrae and halteres yellow.

Male.—Eyes almost imperceptibly short haired; frons at narrowest part about as wide as third antennal segment, interfrontalia not obliterated at middle; arista subnude. Prealar bristle absent; three pairs of closely placed presutural acrostichals present. Abdomen elongate ovate. Both fore femoral thorns short and stout; fore tibia little excised basally, without a median posterior bristle; mid femora without outstanding ventral bristles; mid tibia with one or two anterodorsal and two posterodorsal bristles, and no series of short erect hairs on anterodorsal surface; mid tarsus normal, without outstanding fine hairs; hind femur with a short stout spur close to base on ventral surface consisting of two closely contiguous bristles the apices of which are flexed, the anteroventral surface with three or four bristles on apical fourth; hind tibia with closely placed long setulose hairs on almost the entire length of anteroventral and posteroventral surfaces, and two anterodorsal bristles basad of which there is a series of short setulae extending to base of tibia, calcar long; hind tarsus normal. Wings normal, last section of fourth vein about 1.75 as long as preceding section; first posterior cell hardly narrowed apically.

Female.—Frons a little less than one-third of the head width; ocellar triangle glossy, extending to middle of frons. Prealar short but distinct. Fourth visible tergite fully twice as long as third. Short anterodorsal setulae on hind tibiae less conspicuous and the anteroventral setulae less numerous than in the male, the posteroventral surface bare; mid tibia without a ventral bristle. Length 5 mm.

Type, male, and allotype, reared from nest of robin.
Exp. No. 1033. Sub. 71 and 72 of Cornell University.

This species will run down to the segregate which contains *occulta* Meigen in my key to the males of Hydrotaea published in the BULLETIN of the Brooklyn Entomological Society, 1916, p. 109, but is readily separated by the armature of the hind tibia. From *comata* Aldrich, which it resembles also, it may be separated by the absence of long hairs from the basal segment of mid tarsus. It differs from any European species known to science in several respects.

The female differs from all three species with yellow halteres included in my key to females of this genus which appeared in the same journal, 1918, page 32, in being entirely glossy black.

Velia watsoni Drake—A new Record.—This species was described by Dr. Carl J. Drake, from Gainesville, Fla. As he justly observes in comment on his new species, it closely resembles *V. stagnalis* Burm., for which it may easily be taken, being deemed a slightly larger and darker colored specimen.

I seem to have no other records than that of the original description, the type locality. I have, however, just received a specimen of the species taken by Mr. F. M. Schott at Bridgeton, N. J., on March 23, 1924. This locality, nearly 700 miles north of the original place of capture, shows the wide distribution of this species. Bridgeton is on the edge of the pine barrens, in a marshy, swampy section. This record is another evidence of the austral character of the Pine Barrens of New Jersey.—J. R. DE LA TORRE-BUENO, White Plains, N. Y.

A NOTE ON TROPISMS IN PLEA STRIOLA FIEBER.

By Leonard B. Clark, University of Manitoba.

While collecting at St. Norbert, Manitoba, in the summer of 1924, I had the good fortune to take thirteen specimens of the diminutive back-swimmer, *Plea striola* Fieb. At that time I was investigating the light reactions of *Notonecta undulata* Say and thought it would be of interest to compare the two in this respect.

P. striola has been recorded from widely different parts of America. It has been listed locally only from Como, Quebec in Canada, and from the states of New York, New Jersey, Florida, California, Massachusetts, Texas, Iowa, Illinois and Kansas in the United States. The paucity of the records has, very likely, been due to its more or less superficial resemblance to some of the small crustaceans which abound in the water it inhabits. Hungerford found that it feeds upon these small Crustacea, grasping the prey in the basket formed by its fore-limbs and rolling the victim about until the stylets of the back-swimmer locate a vulnerable point. Heinrich Wefelscheid made a close study of an European form, *P. minutissima* Leach in " Ueber die Biologie und Anatomie von *Plea minutissima* Leach. 1912" and most of our knowledge comes from the above work. He found that this form fed on the juices of the plants found in its habitat.

The bugs spend much time among the tangles of *Chara, Elodea, Myriophyllum* and the other aquatic plants in the neighborhood of which they are generally found. They, like *N. undulata,* are positively thigmotactic, but to a much greater degree. The body is pressed more or less closely to the stem or leaves to which they cling, while *N. undulata* seldom has any part of its body touching its support but grasps this with the two anterior pairs of legs.

The phototropism of *P. striola* was studied in an aquarium kept at a temperature of 21° C. and with a light at each end, one of 123 C. P. and the other of 35 C. P. The aquarium at first contained only water. Every five minutes the lights were reversed and the number of bugs at each end were counted. The results show that out of a series of ten trials, an average of 8.6 individuals went to the strong light, while an average of 4.4 individuals went to the weaker light or moved at random. This shows that *P. striola* is positively phototropic.

Both temperature and the thigmotactic response will modify their positive phototaxis. Thus by placing a bunch of *Myriophyllum* in the center of the aquarium and leaving it there for fifteen minutes until the animals are clinging to it, they give, on repeating the experiment with ten trials, an average of 2.6 bugs at the end of the greatest intensity to .4 bugs at the opposite end. This shows that over fifty per cent. of the *Plea,* after coming to rest against the stems of the plants, are not moved by the light stimulus under these conditions.

However, a similar experiment was again carried out, but at a temperature of 35° C. Twelve specimens were used. They averaged, on ten trials, 11.2 at the light of 123 C. P. to .1 at the light of 35 C. P. In the first three trials, 3, 2, and 1 bugs still clung to the vegetation. At this temperature all the back-swimmers were very active, running up and down the plant and swimming about it. When the lights were turned on, the bugs were wildly phototactic, crowding to the stronger light and remaining there. The rise in temperature decreased their thigmotactic response, while increasing their reaction to light.

The difference in behavior between *P. striola* and *N. undulata* to light appears to be a question of the relative degree in which thigmotaxis and phototaxis predominates in their behavior. In the former, the reaction to contact is much stronger than in the latter, while the reaction to light is more powerful in *N. undulata.* Temperature modifies both insects in the same way, namely, by increasing their phototropic and decreasing their thigmotactic responses.

Errata in Vol. XIX: Microveliae of the Western World.

P. 187, line 21, for " paomensis " read "panamensis."

P. 191, antennal formula for *albonotata* Champion should read: II : I : III : IV.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BUTTERFLY COLLECTORS.—Have you aberrations or freak butterfly specimens for sale or exchange? Professional and private collectors please write. Jeane Gunder, Pasadena, Calif.

HALIBURTON COUNTY, NORTHERN ONTARIO. Will collect in all orders. Many interesting specimens and probably new to fauna there. Especially in Lepidoptera, Coleoptera, Hemiptera, and Hymenoptera. Will visit the above in June. All mail will be forwarded to me. Correspondence promptly answered. Herbert S. Parish, 81 Robert St., Toronto, Canada.

ARKANSAS INSECTS.—Am again collecting. Have Lepidoptera on hand. Miss Louise Knobel, Hope, Ark.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

Wanted--Butterfly Aberrations

If you or your friend find an oddly marked or colored butterfly, I would like to hear about it.—These kinds of freak butterfly specimens are my personal hobby, and I am not a dealer.—If you are selling your collection, it is better to dispose of those specimens separately, to realize more.—Correspondents always promptly answered.

JEANE GUNDER, Pasadena, California

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages 1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII
Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147	Butterflies for trays,
192	All glass mounts,
205	North American Lepidoptera,
249	Exotic Lepidoptera,
212	Insect pests, Summary of collections,
213	Exotic Coleoptera,
214	North American Coleoptera,
234	Insect collections,
229	Life histories of insects,
254	List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

XX DECEMBER, 1925 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

SMITHSONIAN INSTITUTION
FEB 2 1926
NATIONAL MUSEUM

PUBLICATION COMMITTEE
J. R. de la TORRE-BUENO, Editor
DR. J. BEQUAERT GEO. P. ENGELHARDT

Published for the Society by the
Science Press,
Lime and Green Sts., Lancaster, Pa.

Price, 35 cents Subscription, $1.50 per year

Mailed January 27, 1926

Entered as second-class matter January 21 1919, at the postoffice at Lancaster, Pa.,
under the Act of March 3, 1879

The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

OFFICERS, 1925

Honorary President
CHARLES W. LENG

President
W. T. DAVIS

Vice-President
J. R. DE LA TORRE-BUENO

Recording Secretary
E. L. BELL

Corresponding Secretary
HOWARD NOTMAN

Treasurer
G. P. ENGELHARDT
Central Museum
EASTERN PARKWAY

Librarian
ELMER McDEVITT

Curator
A. C. WEEKS

Delegate to Council of New York Academy of Sciences
G. P. ENGELHARDT

CONTENTS

CHANGES IN SYNONYMY OF LEPIDOPTERA, Barnes and Benjamin 189
MELANOPLUS DIFFERENTIALIS ON STATEN ID., Davis 199
A NEW STRIGODERMELLA, Brown 200
MEMBRACIDAE OF CUBA, Metcalf and Bruner 203
BERIS QUADRIDENTATA, Johannsen 214
STUDIES OF N. AM. AEGERIIDAE, Engelhardt 215
A GIANT WATER-STRIDER FROM TONKIN, China 218
NOTE ON GERRIS MIKADO, Torre-Bueno 220
RHOPALOCERA OF EASTERN U. S., AND THREE NEW FORMS, Nakahara 221
A NEW RHINACLOA AND THREE NEW PSALLUS, Knight 225
PIERIS RAPAE AND BREPHOS INFANS, Rogers 228
HINTS ON MOUNTING LEPIDOPTERA, Wood 229
HYLEPHILA PHYLAEUS, Bell 231

Bulletin of the Brooklyn Entomological Society

Published in

February, April, June, October and December of each year

Subscription price, domestic, $1.50 per year; foreign, $1.75 in advance; single copies 35 cents. Advertising rates on application. Short articles, notes and observations of interest to entomologists are solicited. Authors will receive 25 reprints free if ordered in advance of publication. Address subscriptions and all communications to

J. R. de la TORRE-BUENO, Editor,
11 North Broadway, White Plains, N. Y.

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

VOL. XX DECEMBER, 1925 No. 5

CHANGES IN THE SYNONOMY OF LEPIDOPTERA ARISING FROM EXAMINATION OF SOME TYPES IN THE BROOKLYN MUSEUM.

(Lepid., Phalaenidae & Pyralidae.)

BY WM. BARNES AND F. H. BENJAMIN, Decatur, Illinois.

Through the kindness of Messrs. George P. Engelhardt and Jacob Doll, we were enabled to examine a number of unique types in the Collection of the Brooklyn Museum of Arts and Sciences, and present the following report thereon:

Agrotis tenuicula Morr.

1874, Morrison, Proc. Bost. Soc. N. H., XVII, 163, *Agrotis.*
1890, Smith, Bull. U. S. N. M., XXXVIII, 208 (?*perconflua,* ignot.), *Agrotis.*
1893, Smith, Bull. U. S. N. M., XLIV, 67 (?*conflua* form, ignot.), *tenuicola*(!), *Agrotis.*
1903, Dyar, Bull. U. S. N. M., LII, 133, No. 1461, *tenuicola*(!), *Agrotis.*
1903, Hampson, Cat. Lep. Phal. B. M., IV, 402, ignot., *tenuicola*(!), *Agrotis.*
1917, Barnes & McDunnough, Check List, p. 45, No. 1431, *tenuicola*(!), *Agrotis.*

treatii Grt.

1875, Grote, Can. Ent., VII, 186, *Agrotis.*
1890, Smith, Bull. U. S. N. M., XXXVIII, 81, *Noctua.*
1893, Smith, Bull. U. S. N. M., XLIV, 71, *Noctua.*
1898, Smith, Jour. N. Y. Ent. Soc., VI, 103, *Noctua.*
1903, Dyar, Bull. U. S. N. M., LII, 134, No. 1479, *Noctua.*
1903, Hampson, Cat. Lep. Phal. B. M., IV, 398, pl. LXX, f. 10 (type), *Agrotis* (*Diarsia*).

The name *Agrotis tenuicula* Morr. has heretofore presented a very difficult problem.

The original description is short, poor, incomplete, and compares with a species that was probably misidentified by Morrison.[1]

Smith, 1890, states, "The chances are that this is a form of *perconflua* Grt., but I am not prepared to make the reference definitely. I have no idea who could have furnished the type of the species and have never seen any specimens so named."

Smith, 1893, states, "It is more than likely that this will turn out a form of *Noctua conflua* but I have nothing answering nearly enough to it to make sure. I am utterly in the dark as to the location of the type."

Dyar, 1903, marks the name * as being unrepresented in the National Museum.

Hampson, 1903, states it is unknown to him. His description is apparently partly based upon the original description and partly upon European *conflua.*

The name has been spelled *tenuicola* since 1893, only being *tenuicula* in the original description and by Smith in 1890.

The Graef Collection contains an old and faded specimen, its pin bearing the label, "*Agrotis tenuicula* Morr. Coll. Edw. L. Graef." The label is very old, yellowed, and the ink is faded with age.

We call attention to the general misspelling of the name by all authors and the fact that the name on the Graef Collection specimen is spelled correctly.

Mr. Doll informed us that Morrison determined a quantity of material now in the Museum. The older Brooklyn Entomologists, especially in 1874, were more or less in communication with Morrison as other material in the paper containing the original description of *tenuicula* was furnished by Graef.

The Graef Collection specimen does not violate the original description except that the hind wings are not "uniform gray color" but the fuscous of the secondaries fades some with age, and often the secondaries are fuscous in *treatii.*

Apparently aside from the Graef specimen no other specimens have turned up bearing this name for nearly fifty years.

---

[1] *Conflua* Tr. but Morrison presumably had in mind *conflua* Auct. nec Tr. to which Grote afterward applied the name *perconflua,* and which is now listed as a synonym of *jucunda.*

While we do not consider the Graef specimen the original type we feel that because of the circumstances surrounding the name, this specimen should serve to indicate what the name represents, as it was almost certainly named by Morrison, all other authors disclaiming any knowledge of what the name represented.

At any rate, we feel that we have good circumstantial evidence to show what the name represents, and propose to use the name in place of *treatii* Grt.

It may be well to call attention to the fact that prior to some date between 1893 and 1898 *treatii* was only known from a single specimen besides the type (see Smith, 1890, 1893, 1898).

Epipsilia elevata Sm.

1891, Smith, Trans. Am. Ent. Soc., XVIII, 104, pl. II, f. 2, valve ♂ genit., *Pachnobia.*
1893, Smith, Bull. U. S. N. M., XLIV, 64, *Pachnobia.*
1896, Ottolengui, Ent. News, VII, 35, *Pachnobia.*
1903, Dyar, Bull. U. S. N. M., LII, 132, No. 1436, *Pachnobia.*
1903, Hampon, Cat. Lep. Phal. B. M., IV, 488, ignot., *Episilia*(!)(..).

terrifica Sm.

1893, Smith, Ent. News, IV, 98, pl. VI, f. 2, *Setagrotis.*
1894, Smith, Trans. Am. Ent. Soc., XXI, f. 42, pl. II, f. 2, *Setagrotis.*
1903, Dyar, Bull. U. S. N. M., LII, 132, No. 1447, *Setagrotis.*
1903, Hampson, Cat. Lep. Phal. B. M., IV, 487, pl. LXXIII, f. 6, *Episilia*(!)(..).

E. elevata and *terrifica* were described from Colorado (Bruce); the former from a single ♂ (Neumoegen Collection) and the latter from 2 ♂. We have a specimen compared with the type of *terrifica* and the type of *elevata* before us. Only a single species is represented.

We might mention that no specimens were under the name *elevata* in the National Museum *fide* Dyar (1903) and that the species was unknown to Hampson (1903). The difference given by Hampson, black *vs.* yellow below base of cell, is incorrect, the species having a claviform filled with luteous, outlined in black and this is continued mesad of the t. a. line. Why Smith put the names into different genera we do not know. All tibiae are spined, the frons smooth and the vestiture is composed of hair, placing the species in *Epipsilia* (usually spelled *Episilia*). We have single specimens from "S. Utah" (Poling) and Eureka, Utah (Spalding) as well as from "Colo. (Bruce)." The species is rare in collections, probably being an early spring flier. Our only dated specimens are the Utah ones, "Apr. 1–15" and "IV–24–10," respectively.

Polia gnata Grt.

1882, Grote, Can. Ent., XIV, 170, *Mamestra.*
1891, Smith, Proc. U. S. N. M., XIV, 202, 212, 276 (partim.), pl. VIII, f. 13, valve ♂ genit. (type), *Mamestra.*
1893, Smith, Bull. U. S. N. M., XLIV, 116 (partim.), *Mamestra.*
1896, Ottolengui, Ent. News, VII, 37, *Mamestra.*
1903, Dyar, Bull. U. S.N. M., LII, 151, No. 1784 (partim.), *Mamestra.*
1905, Hampson, Cat. Lep. Phal. B. M., V, 86, pl. LXXXVI, f. 8 (type), *Polia.*

Described from Arizona, 1 ♂, Neumoegen Collection. Smith evidently removed a valve from the type as in 1891 he figures the ♂ genitalia stating that aside from the type he knew the species only from a single New Mexican female in his own collection. This valve is missing from the type. The species has been generally represented in collections by New Mexican specimens, in accordance with Smith's 1891 determination. We possess a single New Mexican female labeled "*gnata* Grt. a/c N. M.," but this apparently is the female of a very similar male which has been compared with type *rubrifusa* Hamp. by McDonnough, and not the female of *gnata*. True *gnata* appears rare in collections. Hampson's figure (1905) is not good although taken from type. However, it is essentially correct in the more important details, although incorrect in general habitus. Besides the type we have seen only a single male from Tucson, Arizona.

The species is a member of the *selama-brachiolum-rubrifusa-umbrosa* group. Of the first two names we do not possess specimens, but a study of Strecker's type *selama* shows it to be a good match for a colored figure of type *brachiola.* While we think Strecker's name will be a synonym, lack of material prohibits a definite sinking of the name. These types came from Texas. New Mexican *rubrifusa* is certainly distinct from any species known to us. The types of *umbrosa* described from Arizona and Colorado ought to be reexamined to determine if only a single species is represented. Certainly a specimen (♀) matched with the Colorado type seems distinct.

Oncocnemis chorda Grt.

1880, Grote, Can. Ent., XII, 256, *Homohadena.*
1890, Smith, Proc. U. S. N. M., XIII, 398, 401, *Homohadena.*
1893, Smith, Bull. U. S. N. M., XLIV, 157, *Homohadena.*
1903, Dyar, Bull. U. S. N. M., LII, 125, No. 1320, *Homohadena.*
1903, Smith, Jour. N. Y. Ent. Soc., XI, 11, *Oncocnemis.*
1906, Hampson, Cat. Lep. Phal. B. M., VI, 169, pl. C, f. 7 (type), *Oncocnemis.*

refecta Sm.

1894, Smith, Trans. Am. Ent. Soc., XXI, 65, pl. VI, f. 11, *Oncocnemis.*
1903, Dyar, Bull. U. S. N. M., LII, 127, No. 1368, *Oncocnemis.*
1903, Smith, Jour. N. Y. Ent. Soc., XI, 11, *chorda, Oncocnemis.*
1906, Hampson, Cat. Lep. Phal. B. M., VI, 169, *chorda, Oncocnemis.*

Oncocnemis chorda extremis Sm.

1890, Smith, Ent. Amer., VI, 30, *Oncocnemis.*
1893, Smith, Bull. U. S. N. M., XLIV, 160, *Oncocnemis.*
1903, Dyar, Bull. U. S. N. M., LII, 126, No. 1340, *Oncocnemis.*
1906, Hampson, Cat. Lep. Phal. B. M., VI, 168, ignot., *Oncocnemis.*

O. chorda and *O. refecta* were described from Colorado. Hampson (1906) figures the type of the former; and Smith (1894) figures the type of the latter. Normal specimens often show less black in the terminal and subterminal areas of the primaries.

The single type (♀) of *extremis* is a heavily black marked form from " N. W. British Columbia " and in view of the extreme variability of the species we are inclined to consider it conspecific with *chorda.* In fact Hampson's figure of type *chorda* is much closer to type *extremis* than it is to most western specimens of *chorda*. We only know true *extremis* from the type in the Neumoegen Collection. Lack of topotypical material compels us to save the name as a subspecies rather than to drop it to mere form status.

Fotella Grt.

Type *Fotella notalis* Grt.

1882, Grote, Can. Ent., XIV, 181, *notalis* sole species and therefore type.
1909, Hampson, Cat. Lep. Phal. B. M., VIII, 232, type designated *notalis*.

In a number of genera Hampson has overlooked a slight spreading prothoracic crest, only to be seen in fresh material. These are *Escaria* Grt., *Aleptina* Dyar, *Prorachia* Hamp., *Hadenella* Grt., and *Fotella* Grt. Nevertheless we find no conflict with other named genera possessing prothoracic tufts.

Fotella was characterized by Hampson from a single female (the type) of *cylindrica*. He did not know *notalis* Grt. the genotype of *Fotella*. Generically *notalis* differs from *cylindrica* by posessing on the rounded front a circular corneous ring which possesses a central small rounded navel-like tubercle. Grote's original description of *Fotella* calls attention to this feature.

Fotella notalis Grt.

1882, Grote, Can. Ent., XIV, 181, *Fotella*.
1893, Smith, Bull. U. S. N. M., XLIV, 195, *Fotella*.
1903, Dyar, Bull. U. S. N. M., LII, 109, No. 1099, *Fotella*.
1909, Hampson, Cat. Lep. Phal. B. M., VIII, 233, pl. CXXVIII, f. 13 (type), ignot., *Fotella*.
1912, Barnes & McDonnough, Can. Ent., XLIV, 54, 217, Fotella.

Hampson's figure of type is too large, as the actual measurement is 29 mm. The x in place of the reniform on the figure is due partly to a constricted reniform, but mainly to the imagination of the artist. The orbicular is represented by a few whitish scales.

Structurally the type agrees with the types of *olivia* and *cervoides* and with a specimen compared with the type of *fragosa*.

We fail to match the type which in some respects is intermediate between *olivia* and *fragosa,*[2] but differs by being larger and in possessing a few white scales tending to form a streak on the median vein. It may be an aberration or variety of either, or a distinct species. In fact we would not be greatly surprised if long series of specimens showed all three names conspecific, although probably valid as races or forms.

Fotella olivioides sp. nov.

A fourth form or species occurs which differs from typical *olivia* by being much darker, more heavily powdered with black, less contrastingly marked.

Type locality: Palm Springs, Riverside Co., Calif.

Types: Holotype ♀ and 1 ♀ Paratype, 16–23 March.

Afotella gen. nov.

Type *Hadena cylindrica* Grt.

Proboscis fully developed; palpi upturned. the second joint slender, reaching to middle of frons and fringed with scales in front; the third short; frons with a roughened rounded prominence with a corneous plate below it; eyes large, rounded; antennae ciliated in both sexes, the ♂ with the cilia almost fasciculate; head and thorax clothed with scales only; a ridge of scales between and over the bases of the antennae; prothorax with a small spreading crest; metathorax with a large spreading divided crest; tibiae slightly fringed with hair; abdomen with a dorsal crest at base only; build slender; wings ample. Fore wing with the apex rounded, the termen evenly curved; veins 3, 5 from near angle of cell; 6 from upper angle, 9 from 10 anastomosing with 8 to form the areole, 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from somewhat below middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with cell near base only.

Namangana epipaschia Grt.

1883, Grote, Trans. Kans. Acad. Sci., VIII, 49, *Homohadena.*
1890, Smith, Proc. U. S. N. M., XIII, 398, 401, *Homohadena.*

---

[2] See 1912, B. & McD., Contr. N. H. Lep. N. A., I, (4), 17, pl. VIII, f. 12, and II, (1), 12, pl. V, f. 12.

1893, Smith, Bull. U. S. N. M., XLIV, 157, *Homohadena.*
1903, Dyar, Bull. U. S. N. M., LII, 125, No. 1321, *Homohadena.*
1906, Hampson, Cat. Lep. Phal. B. M., VI, 191, ignot., *Homohadena.*
1917, Barnes & McDunnough, Check List, p. 69, No. 2625, *Namangana.*

Namangana epipaschia praeacuta Sm.

1894, Smith, Trans. Am. Ent. Soc., XXI, 61, pl. III, f. 6, *Platyperigea.*
1903, Dyar, Bull. U. S. N. M., LII, 109, No. 1097, *Platyperigea.*
1909, Hampson, Cat. Lep. Phal. B. M., VIII, 548, text fig. 154, *Namangana* (. . . .).
1917, Barnes & McDunnough, Check List, p. 69, No. 2626, *Namangana.*

.. There is a type (♂) of *N. epipaschia* in the Neumoegen Collection, labeled "Homohadena epipaschia Grote type" in Grote's handwriting, and "Near Hot Springs, Las Vegas, N. M. 7,000 ft. July, '82, F. H. Snow." Apparently the description is based upon a single specimen.

Until 1917 the name was placed as a *Homohadena,* unknown except for the type, but Barnes & McDunnough recognizing its affinity to *praeacuta,* placed it in *Namangana.*

We have carefully studied the type which appears structurally the same as that of *praeacuta,* which is variable and which is in the Barnes Collection from Arizona, Colorado, California, Idaho, Washington, and British Columbia. The course of the transverse lines is the same and the dorsum of the thorax possesses the same rufous tinted scales. The main distinction between the two forms is that the type of *epipaschia* has a diffused black submedian shade conecting the t. a. and t. p. lines; and a black terminal area; while the subterminal area is slightly paler, the ordinary spots more diffuse and the cell with more black filling than usual for *praeacuta.*

These two form a distinct group not very closely allied to any other species known to us, and may ultimately need a new genus to accommodate them.

Although the types are certainly not similar in superficial appearance, the structures and transverse maculation being the same in both, we think only a single species is represented. It is probable that the type of *epipaschia* is an aberration and *praeacuta* is the normal form. Lack of topotypical material of the former compels us to place them as subspecies of one another.

Zale termina Grt.

1883, Grote, Can. Ent., XV, 129, *Pheocyma*(!).
1893, Smith, Bull. U. S. N. M., XLIV, 368, *Phaeocyma.*
1897, Ottolengui, Ent. News, VIII, 244, *Pheocyma*(!).
1903, Dyar, Bull. U. S. N. M., LII, 238, No. 2981, *Pheocyma*(!).
1913, Hampson, Cat. Lep. Phal. B. M., XIII, 335, "species omitted," "?*Noctuinae*," *Pheocyma*(!).
1917, Barnes & McDunnough, Check List, p. 86, No. 3377, *Coxina.*

yavapai Sm.

1908, Smith, Proc. U. S. N. M., XXXV, 219, 221, 267, 273, 274, 275, pl. XXXIII, f. 6 ♂ genit.; pl. XXXV, f. 11 ♀ genit.; *Phaeocyma* (*Zale*).
1913, Hampson, Cat. Lep. Phal. B. M., XIII, 245, pl. CCXXXI, ff. 3, *Zale* (*Zale*).

Described from "two or three" females from Arizona. Smith (1893) states the type is in the Neumoegen Collection, and Ottolengui (1897) lists a single female type in that collection. Dyar (1903) lists the species as not in the National Museum, and it was unknown to Hampson (1913). Barnes and McDunnough (1917) did not know the species and listed it in *Coxina,* apparently for the reason that Smith omitted it from his revision of "*Phaeocyma*" and Hampson listed it as "?*Noctuinae*." The original description clearly indicates either a *Zale* or a *Coxina.*

Examination of the type female in the Neumoegen Collection shows spined mid tibiae, placing the species in the genus *Zale,* where it is a perfect match for the Barnes Collection 2 ♂ 2 ♀ "cotypes," and series, of *Zale yavapai* Sm.

In view of the fact that the species has been so generally unknown and the indefiniteness of the number of types in the original description we hereby select the female type in the Neumoegen Collection as the lectotype of the name.

CUTINA Wlk.

Type *Cutina albopunctella* Wlk.

1866, Walker, Cat. Lep. Het. B. M., XXXV, 1734, *albopunctella* sole species and therefore type.

1913, Hampson, Cat. Lep. Phal. B. M., XIII, 157, type designated *albopunctella*.

Cutina distincta Grt.

1882, Grote, Papilio, II, 184, *Eustrotia*.

1893, Smith, Bull. U. S. N. M., XLIV, 311, *Erastria*.

1903, Dyar, Bull. U. S. N. M., LII, 209, No. 2609, *Eustrotia*.

1910, Hampson, Cat. Lep. Phal. B. M., X, 805, "species omitted," *Eustrotia*.

inquieticolor Dyar.

1922, Dyar, Ins. Insc. Menst., X, 169, *Taseopteryx*.

1925, Barnes & Benjamin, Proc. Ent. Soc. Wash., in litt., *Cutina*.

C. distincta Grote has heretofore been known only by the single type in the Neumoegen Collection. No locality is given in the original description. We think likely that Smith's listing (1893) of this species from Arizona is pure guess work on his part. In this he has been followed by subsequent authors. Dr. Dyar described *inquieticolor* as an Erastriid from two types, females, Stemper, Hillsboro County, Florida, Fred Marloff.

One type was retained in the U. S. National Museum and the other returned to Mr. Marloff who donated it to the Barnes Collection.

Types of both names are before the authors and agree.

We have discussed the proper placement of *inquieticolor* in a paper to appear in the Proc. Ent. Soc. Wash. Spines on the mid tibiae place the insect in the Catocalinae where it fits well into the genus *Cutina*.

Besides the Marloff type of *inquieticolor* the species is represented in the Barnes Collection by single specimens from Hastings, Florida, and Greenville, Mississippi (Geo. Dorner). It will probably be found to be a generally distributed inhabitant of the Gulf Strip division of the Lower Austral Faunal Zone.

Loxostega plana Grt.

1882, Grote, Papilio, II, 184, *Prothymia*.

1893, Smith, Bull. U. S. N. M., XLIV, 307, *Prothymia*.

1903, Dyar, Bull. U. S. N. M., LII, 210, No. 2625, *Prothymia.*
1916, Barnes & McDunnough, Contr. N. H. Lep. N. A., III, (1), 18, *Phytometra* (*Prothymia*).

roseiterminalis B. & McD.
1914, Barnes & McDunnough, Contr. N. H. Lep. N. A., II, (6), 233, pl. I, f. 8, *Loxostege.*

The single type of *plana* is a female in the Neumoegen Collection. It was described from Arizona.

L. roseiterminalis B. & McD. was described from San Benito, Texas.

The types of both names agree. Besides the types of *roseiterminalis* the Barnes Collection now possesess specimens from Douglas and Yavapai County, Arizona.

The Grasshopper Melanoplus differentialis on Staten Island, N. Y.—On the 8th of October, 1925, four additional specimens of the grasshopper *Melanoplus differentialis* (Thomas) were discovered near Old Place, Staten Island, the only known locality for the species in the state of New York. They were on the edge of the salt meadow among some plants of *Rumex,* and one was in a drier situation on filled-in ground.

The first record for this species for New York state is in the Journal of the N. Y. Ent. Soc. for December, 1924, where some account of its extension northward along the Atlantic coast is to be found. It is a common species in many of the western states, where it is sometimes injurious.

Hundreds of freight cars stand on the sidings near to where this grasshopper has established itself, and it is quite possible that it was thus artificially transported northward by the railroad.
—Wm. T. Davis, Staten Island, N. Y.

A NEW SPECIES OF STRIGODERMELLA.

(Coleoptera, Scarabaeidae.)

By W. J. Brown, Oklahoma A. and M. College, Stillwater, Oklahoma.

The following species is included in the Kansas lists of Coleoptera as *Strigoderma pygmaea* (Fab.) and is probably confused with that species in collections.

Strigodermella knausi n. sp.

Male: Length 6–6.7 mm.; width 3.1–3.6 mm. Similar to *Strigodermella pygmaea* (Fab.) in form and coloration. Shining; head, thorax, and scutellum piceous with distinct violaceous or greenish luster, the thorax usually with a pale area on each side near anterior angle; elytra varying from flavo-testaceous with suture and external margins narrowly piceous to piceous with one subapical and one or two subbasal flavo-testaceous spots; under surface piceous, the legs usually somewhat paler; body clothed with moderately long, greyish hairs.

Head slightly more than half as wide as the pronotum; with a few hairs near the eyes; coarsely, roughly, and confluently punctured except on the vertex where the punctures become separated. Clypeus trapezoidal, the angles rather broadly rounded, the margins rather strongly reflexed, the suture distinct. Eyes moderate, not prominent. Antennal club equal in length to the entire stem.

Pronotum one-third wider than long, widest in front of middle, sides feebly converging to base, the basal angles obtuse but narrowly rounded; sides more strongly converging apically, the anterior angles prominent and subacute; base broadly lobed medially. Pronotal bead coarse and entire. Pronotal surface moderately convex, sparsely hairy, and microscopically alutaceous; an inconspicuous, shallow depression on each side; the punctures large and shallow, and with the bottom of each roughened by several very fine punctules; puncturation not close except on a large area just mesad the lateral depression where the puncturation is confused by fine and dense secondary punctures which are very sparse or absent on the other portions of the disk; a rather closely punctured line extending meso-caudad from each lateral depression to median area near base; median line very feebly impressed on about apical half, more closely punctate than adjacent portions of disk. Scutellum coarsely, not closely punctate.

Elytra as wide as length of elytral suture, slightly wider than the pronotum, very broadly rounded at apex, the sides feebly arcuate; a few very inconspicuous hairs near lateral margin and on basal third. Elytral striae broad, feebly impressed, five in number between suture and humeral umbone, those laterad the humeral umbone confused; punctures of striae coarse, very shallow and rather closely placed. Interspaces moderately convex, irregular in width but always wider than the striae, impunctate.

Pygidium tumid subcentrally; sparsely hairy; the sculpture concentric, shallow, not close, and subrugosiform. Under surface of thorax more conspicuously hairy; finely, densely, and intricately sculptured. Intermesocoxal space strongly convex, slightly tumid. Under surface of abdomen with only a few hairs; coarsely, shallowly, not closely punctate. All femora and tibiae coarsely and sparsely punctate; the tooth of the anterior tibia acute, prominent; larger claws of anterior and middle tarsi cleft, the upper rami very small and slender.

Genital armature symmetrical; length 1.7 mm.; dorsal aspect of claspers triangular in outline; each clasper about twice as long as its width at base, the sides nearly straight.

Female: Unknown.

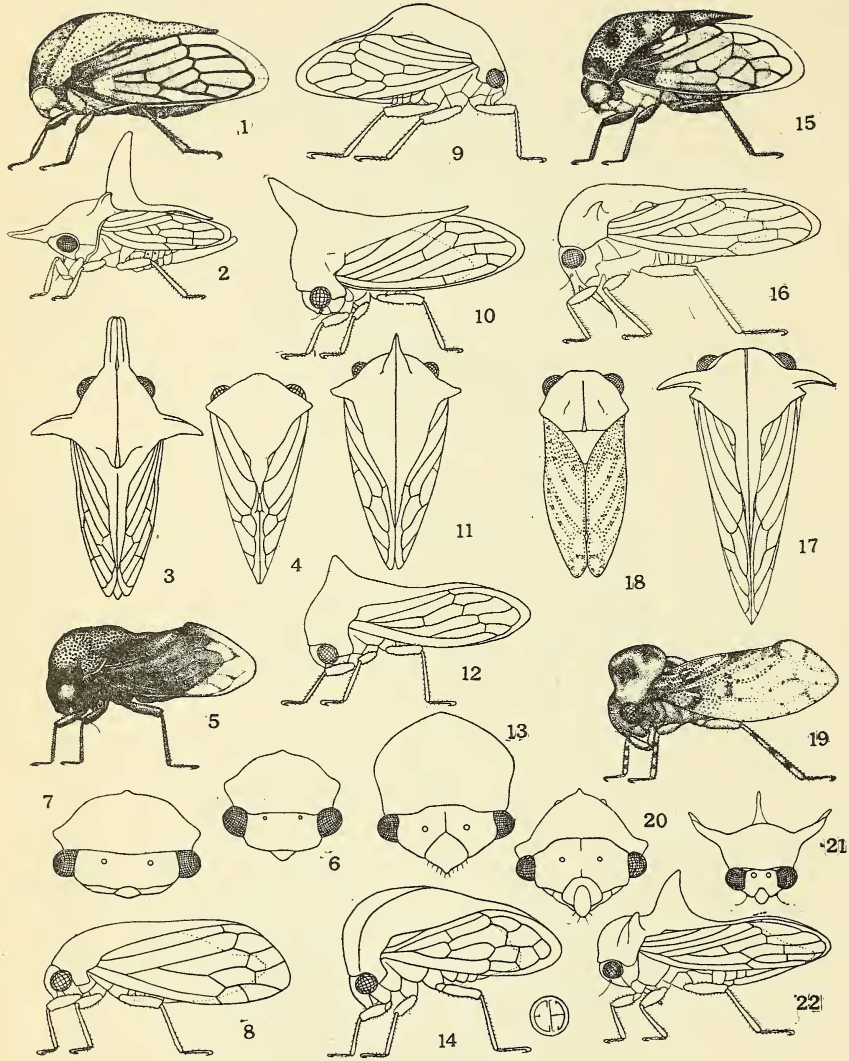
Holotype. Male: " Medora, Ks.; W. Knaus; June."

Paratypes. 19 males: " Rago, Kingman Co., Kan.; June; W. Knaus." 10 males: " Medora, Kans., Sand Hills; June, 1923; R. H. Beamer."

Holotype and some paratypes in the collection of Mr. Warren Knaus; other paratypes in the collections of the University of Kansas, Oklahoma Agricultural and Mechanical College, and in that of the author.

S. knausi has the form and general appearance of *S. pygmaea* (Fab.). Its larger size and coarser pronotal puncturation, however, serve to distinguish it from *pygmaea* and from the doubtfully valid *S. floridana* (Ohous) also, judging from the description of the latter. Although the pronotal puncturation of *pygmaea* is variable, the coarser thoracic punctures in that species are never large, subcircular, shallow, and with flat and roughened bottoms as in *knausi.* The male genital armature of *knausi* differs from that of *pygmaea* only in size, that of the former being slightly larger.

Mr. Knaus has informed me that the Rago specimens were " taken some fifteen years ago by sweeping grass in the early evening."


1
9
15
2
10
16
3
4
11
18
17
12
5
13
19
7
6
20
21
8
14
22

Membracidae of Cuba.

MEMBRACIDAE OF CUBA.

By Z. P. Metcalf and S. C. Bruner.

This is the second of a series of papers on the Homoptera of Cuba. The specimens have been collected by the junior author and his associates. The Membracidae of Cuba have been neglected by the students of this family; for as far as our records show, only ten species have been described by previous workers from Cuba. Ranked according to the time that they were described these species are as follows: *Membracis fasciata* described in 1798 by Fabricius. In 1846 Fairmaire in his Revue des Membracides described three species from Cuba: *Centrotus poeyi, Centrotus havanensis,* and *Centrotus flavidus.* In 1857 Guérin-Méneville in de la Sagra's Histoire de l'Ile de Cuba described one new species, *Hoplophora fairmairii,* and redescribed Fairmaire's three species listed above. He also listed *Ceresa uniformis* Fairmaire from Cuba. In 1869 Stål assigned *fasciatus* Fabricius and *flavidus* Fairmaire to his genus *Monobelus* and described a new species, *lateralis* from Cuba. In the same year, in his Bidrag till Membracidernas Kannedom, Stål described the genus *Goniolomus* for the new species *tricorniger* from Cuba. He also described the new species *Stictocephala rotundata* from Cuba for the species that had been previously listed as *Ceresa uniformis* Fairmaire by Guérin-Méneville. In 1894 Fowler described *Enchotype cocinna* from Cuba and in 1907 Baker described *Darnoides semicrema.* The synonymy of these species is dealt with below.

We recognize nine of these species as distinct, and include records of three species previously recorded from Florida. In addition we have two new genera and nine new species. These results will indicate how inadequately the Membracid fauna of Cuba is known.

Subfamily **Smiliinae.**

Genus **Micrutalis.**

The species of this genus are very variable in color and form, and while we have a limited number of specimens from Cuba, these specimens simply confirm this generalization. The lateral lobe-like extensions of the prothorax between the eyes and the base of the wings are very constant in size and shape, in the limited series before us. We believe, therefore, that these structures furnish reliable characters for specific determinations in this troublesome genus.

Micrutalis calva Say.

There are four specimens: one from Santiago de las Vegas, December 31; one from Camagüey, July 30; one from Mancanillo, July 31, and one from Pico Turquino, July 22, which agree in all essential characters with the common *calva* of the United States. In addition to these typical specimens, there are three specimens which are nearly uniform pale clear yellow, with eyes darker, and usually a few blackish spots on pronotum and legs. These forms cannot be distinguished structurally from *calva*, and appear to be merely a color variety of that species. In addition to the localities mentioned above, specimens of this pale variety are at hand from L. de Ariguamavo, October 15.

Brachytalis gen. n.

This genus is closely related to *Acutalis* Fairmaire but the venation of the wings is entirely different and the pronotum is much shorter, not reaching the apex of the abdomen. It is also closely allied to *Trachytalis* Fowler, but its face is very much broader; the pronotum is smooth and shiny and much shorter than in that genus, and the wing venation is slightly different.

> Head broad, with the eyes nearly as broad as the pronotum across the humeral angles; face broad and short, about twice as broad as long; ocelli near the posterior border and about equidistant from each other, and the eyes. Pronotum broad, depressed, smooth and shining, short, barely reaching the apex of the clavus; humeral horns short, blunt, nearly rectilinear; lateral lobes prominent, the margins reflexed dorsad; median carina of the pronotum scarcely indicated. Legs simple, posterior tarsi longest. Tegmina semiopaque, venation somewhat obscure. A single discoidal area from which the apical cells radiate; the apical cells five, the third not stylate.

Type of Genus *Brachytalis fuscus* n. sp.

Brachytalis fuscus n. sp. (Figs. 7, 8.)

The large species of the genus, with a very much depressed pronotum and a general fuscous color.

Head broad and short, smooth and shiny; antennae short, the basal segments almost concealed by the ledges; clypeus flat, nearly as broad as long; mouth parts reaching the middle coxae; general color of the head pale fuscous; the anterior margin with a blackish stripe, eyes reddish. Pronotum broad, much depressed, smooth and shiny, with obscure punctures which are more prominent caudad; humeral angles very obtuse, rounded at the apex; lateral lobes elongate, tongue-like, the apex directed caudad, and reflexed, apex of the pronotum reaching the apex of the clavus; general color of the pronotum fuscous with a broad pale yellow band across the middle, anterior margin next to the head with a narrow blackish band. Wings semiopaque, roughened, venation obscure; claval veins and costal margins punctate, general color of the wings fuscous. Whole venter including coxa and trochanters blackish, rest of the legs fuscous, with the knees, apex of the tibia and tarsi blackish.

Length to apex of tegmina ♀ 3.53, ♂ 3.07; to the apex of the pronotum ♀ 2.61, ♂ 2.15; width across the humeral angles ♀ 1.76, ♂ 1.41.

Holotype ♀ Pico Turquino, July 20, 1922, 5,000 feet. S. C. Bruner and C. H. Ballou. Allotype ♂ Sierra Maestra, July 10 to 20, C. H. Ballou and S. C. Bruner, about 4,500 feet. Paratypes one ♀ Pico Turquino, July 20, 1922, 5,000 feet, S. C. Bruner and C. H. Ballou. One ♀ Sierra Maestra, July 10 to 20, C. H. Ballou and S. C. Bruner, about 4,500 feet.

The specimens from Sierra Maestra are pale golden in color without the characteristic markings, but structurally we have not been able to distinguish them.

Brachytalis fuscoalis n. sp.

This is a more depressed and more slender species than *fuscus,* with fuscous colored wings, and distinct lateral lobes.

Head broad, short; strongly prolonged anteriorly, and recurved. Pronotum narrow, gradually attenuated to a slender apex which reaches to slightly beyond the end of clavus; humeral angles much less produced than in *fuscus*; lateral lobes strongly produced, strongly recurved without an impressed line along the anterior margin; pronotum with a few impressed points caudad; general color black, the apex fuscous. Entire tegmina fuscous, the venation darker and a little more distinct than is characteristic for the genus. Legs uniformly reddish brown. Abdomen blackish, shading to reddish brown along the apical margin of each segment.

Length to apex of tegmina 3.07; length to apex of pronotum 2.15.

Holotype ♂ Sierra Maestra, July 10 to 20, 1922, C. H. Ballou and S. C. Bruner; above 3,000 feet.

Stictocephala rotundata Stå. (Figs. 13, 14.)

This species seems to be fairly common in Cuba. Specimens are at hand from Santiago de las Vegas, Miranda and Nagua Oriente. Specimens have been taken in January, February, April, July and August, October, and December.

This is a small species with a well elevated pronotum. The humeral angles are scarcely produced, and the lateral carinae of the metopidium meet at about the middle. The face is somewhat elongated, being slightly more than one-half as long as the width between the eyes; clypeus scarcely produced. Color of head, prothorax, leg and abdomen nearly uniform. Pronotum in fresher specimens obscurely spotted with greenish.

Genus **Idioderma** Van Duzee.

This genus was described from Florida for two species, *Idioderma virescens* Van Duzee and *Idioderma varia* Van Duzee. We have typical specimens of *virescens* from Santiago de las Vegas taken in July, August and September, and from Bolondrón, P. de Guanahacabibes, and we have also a single female specimen of *Idioderma varia* from Santiago de las Vegas, taken from spider web, October 1. This specimen differs slightly from the original description in the distribution of the color markings, otherwise it seems to be identical.

Subfamily **Hoplohorinae.**

Genus **Enchotypa** Stål.

Only three species have been described for this genus. *Hoplophora fairmairii* Guérin is the type. Both Goding and Fowler spell the name of this genus *Enchotype,* but the name was spelled originally *Enchotypa,* and the original spelling should be retained.

Enchotypa fairmairii Guérin. (Figs. 10, 11.)

This species seems to be fairly constant in all its characters. Specimens are at hand from Havana, Santiago de las Vegas and Camagüey.

Enchotypa concinna Fowler. (Fig. 12.)

This species was described from specimens with short, broad pronotal horns. We have two specimens from Santiago de las Vegas which agree in every respect with the original description. We have a strong suspicion, however, that this is merely a variety of typical *fairmairii,* but since there are no intermediate forms, we will keep this species separate.

Subfamily **Centrotinae.**

Genus **Orthobelus** Stål.

In this genus we place the *Centrotus havanensis* Fairm. and *Centrotus poeyi* Fairm.

Orthobelus havanensis Fairm. (Figs. 16, 17.)

This is one of the largest species of Membracids from Cuba. Its conspicuous bluish black color, white pleural pieces, white scutellum and creamy basal wing fascia will readily distinguish it. Specimens are at hand from Nagua and Camagüey.

Orthobelus poeyi Fairm.

This species was originally described from Cuba, but as far as our records show, has not been recognized since. We have a single specimen from Hoyo Colorado, Havana Province, which agrees in every respect with Fairmaire's short description. It is certainly very close to *havanensis.* It differs, however, in being longer, and more slender. The color is reddish brown, instead of bluish black. The lateral horns are longer and broader at the base, not so much recurved; the posterior border of the lateral horns is provided with a series of small sawtooth-like projections. The posterior process of the pronotum more definitely sinuate, and more decurved. We strongly suspect that this is merely a variety of *havanensis,* but more specimens need to be available before placing it as a synonym of that species.

Goniolomus tricorniger Stål. (Figs. 21, 22.)

This is a very abundant and apparently quite variable species, being especially variable as to the size and shape of the lateral and dorsal horns, and as the color. Typical specimens have acute lateral horns, slender acute dorsal horns with most of the thorax, excepting the horns yellowish testaceous; at the other end of the series are forms with obtuse lateral horns which do not taper and are wider near the apex than at the base. In these forms the dorsal horn is short, and broad at the base and the general color is blackish fuscous. Intermediate forms can be found, however. Specimens are at hand from Camagüey, July 15, 25, 30, and 31.

Genus **Nessorhinus** A. & S.

Two species have been described previously for this genus, both from Porto Rico. We describe below a single species of this interesting genus from Cuba.

Amyot and Serville describe the anterior horn as deeply grooved ("Ce prolongement creusé en gouttière en dessous et horizontal"), but in one or two of the specimens before us the apical portion of this horn is made up of two separate prolongations which are not closely appressed along the median line. Close examination under the microscope shows that in most of the specimens these prolongations are so closely appressed as to appear as a single prolongation with a median groove, but they are actually double in all cases.

Nessorhinus gracilis n. sp. (Figs. 2, 3.)

This species differs from *Nessorhimus vulpes* A. and S. chiefly by the more slender anterior process of the pronotum with more slender lateral processes and more elongate dorsal process and a more slender posterior process.

> Head strongly deflexed; clypeus in the same plane as the vertex; antennal ledges small; antennal flagellum elongate; proboscis reaching the posterior coxae; general color of the head rufous. Pronotum densely and uniformly punctate; anterior process elongate; basal width equalling one-half the width of the vertex, apical two-thirds made up of two separate processes, which are strongly carinate dorsad and ventrad, and weakly carinate laterad, closely appressed medially and gradually tapering to obtuse apices; lateral horns triangular, acuminate flattened, carinate dorsad; dorsal horn elongate, compressed, broadly rounded apically, slightly curved caudad, the anterior margin carinate, posterior margin bicarinate; posterior process elongate, slender, deflexed, following the contour of the wing, nearly attaining the apex of the abdomen; whole surface of the prothorax uniformly and minutely punctate; general color rufous, the posterior process yellowish testaceous and the horns blackish. Scutellum barely indicated externally. Tegmina semiopaque

blackish fuscous, veins rufous. Legs and venter fuscous, densely clothed with golden pile.

Length, apex of anterior process to apex of tegmina ♀ 8.1 mm.; ♂ 6.3; width across lateral processes ♀ 4.6, ♂ 3.5.

Holotype ♀ Camagüey, July 24, 1923, J. Acuña. Allotype ♂ Camagüey, July 31, 1923, J. Acuña. Paratypes one ♂ Camagüey, July 26, 1923; two ♀ ♀ Camagüey, July 27, 1923; six ♀ ♀ and two ♂ ♂ Camagüey, July 30, 1923.

Genus **Monobelus.**

This is apparently the most abundant genus of Membracidae in Cuba. The species are for the most part small in size, and might readily be confused with species of the genus *Acutalis* as far as general appearances are concerned. The scutellum is exposed, however, and the venation is entirely distinct.

Monobelus flavidus Fairmaire. (Fig. 1.)
=*Darnoides semicrema* Baker.

This is the smallest species of the genus from Cuba, rather variable in size, and rather broad for its length. Specimens are at hand from Santiago de las Vegas, January and July, from Nagua, July 7, 1922; from Taco Taco, April 1 and 6, 1922, and from Candelero. One of the specimens from Nagua and one from Taco Taco have the posterior processes bright grass green, instead of yellowish as in the other specimens. This may be the color characteristic of the living specimens. Nymphs are at hand from Candelero. We believe that this is the species redescribed as *Darnoides semicrema* by Baker, as his description agrees in most respects but he apparently failed to note the narrowly exposed scutellum.

Monobelus fasciatus Fabricius.

This species is about the same length as *M. flavidus* but is much more slender. Some of the specimens are uniformly black, while others have a faint yellow stripe along the lateral margins of the prothorax. Specimens are at hand from Pico Turquino, July 20, 4,500 to 5,000 feet, S. C. Bruner and C. H. Ballou, and from Sierra Maestra, July 10 and 20, 3,500 to 4,000 feet, on Palma Mocha Mountain.

Monobelus lateralis Stål.

This is the largest of the previously described species, and is readily distinguished by the distinctly fusco-punctate posterior process. In some of the specimens before us, the lateral margin of the front is yellow, as described by Stål, and in other specimens the front is uniformly black, or nearly uniformly black, with a short pale yellow stripe next the eye. One specimen has the anterior margin of the prothorax with a broad pale yellow band. Specimens are at hand from Camagüey, July 15, 1923, on *Misanteca trianda* Mez, and from Bolondrón.

Monobelus turquinensis n. sp.

This is the largest species of the genus, being longer than *M. lateralis*. It is of uniform blackish color with deep fuscous wings, with the prothorax more depressed than in *lateralis*.

> Face broad, transverse, impressions faintly indicated; uniformly black with pale lateral margins. Pronotum much depressed with the posterior process slightly more slender than in *lateralis*, nearly as in *fasciatus*; uniformly black, with the humeral angles faintly yellow, minutely punctured anteriorly, faintly punctured caudad, the median carina strongly elevated caudad; the posterior process with evident lateral carina, from apex to the apex of the scutellum. Scutellum evident, strongly punctured, black, the apex faintly yellow. Tegmina strongly infuscated, the veins mostly blackish, basal fascia only faintly indicated. Venter and legs chiefly black.
>
> Length to apex of tegmina ♂ 5.84, ♀ 6.77; length to apex of pronotum ♂ 4.61, ♀ 5.38.

Holotype ♂, Taco Taco, April 6, 1922, S. C. Bruner and C. H. Ballou. Allotype ♀, Pico Turquino, July 20, 1922, 5,550 feet, S. C. Bruner and C. H. Ballou.

Monobelus niger n. sp. Fig. 9.

This is another large species of uniformly blackish color with the posterior process strongly compressed, strongly elevated and deeply impressed either side behind the scutellum.

> Face elongate, not twice as broad as long, clypeus prominent, anterior margin of the face broadly rounded; eyes prominent. Pronotum strongly elevated, humeral angles conspicuous, but obtuse, posterior process distinctly depressed, strongly elevated above the scutellum into an obscure crest which is distinctly impressed either side behind the scutellum; apex of the posterior process with distinct lateral carinae; general color of the pronotum black, with irregular obscure yellow markings. Tegmina opaque, black-

ish. Most of the cells clear yellow centrally. Venter and legs black, the legs rather slender.

Length to apex of tegmina ♀ 6.77, ♂ 5.07.

Holotype ♀, Camagüey, July 15, 1923, J. Acuña on *Misanteca trianda* Mez. Paratype ♀, Taco Taco, March 26, 1922, J. Acuña.

In many respects this species is out of place in the genus *Monobelus.* It bears in general appearance about the same relation to that genus that many of our North American species of *Cyrtolobus* bear to *Atymna.* We do not care to describe the genus as new, however, until more specimens are at hand.

Monobelus irroratus n. sp. (Fig. 15.)

This species may be recognized by its small size broad short form, and pale colors.

Head broad, the face about one and one-half times as broad as long, at the anterior margin broadly rounded and distinctly impressed; the whole surface irregularly punctate, the median line distinctly impressed, clypeus prominent. Pronotum broad, short, irregularly punctate, punctures fuscous and prominent; the apex of the posterior process blackish. Scutellum large. Tegmina semi-transparent, the base black and distinctly punctate with a creamy yellow basal fascia. Venter and legs mostly chestnut, more or less clouded with blackish.

Length to apex of tegmina ♀ 5.54, to apex of pronotum 4.30.

Holotype ♀, Camagüey, July 3, 1923, J. Acuña. Allotype 3 ♀ ♀, Camagüey, July 3, 1923, J. Acuña, on *Belaria mucronata* Gris.

This species is somewhat anomalous in the genus *Monobelus,* but it is difficult to find generic characters which will distinguish it.

Brachycentrus gen. n.

This is a genus of small species with a short broad posterior process. It is somewhat closely related to *Amblycentrus* Fowler. It may be readily distinguished, however, by the fact that the base of the clavus and the base of the corium are strongly punctate, and obscurely veined. The apex of the tegmina is semi-transparent with distinct venation. The posterior process is broad, elongate, reaching the apex of the clavus.

Head broad, nearly twice as broad as long; the ocelli widely separated almost touching the basal margin. Pronotum well elevated, produced into triangular processes on either side. Posterior process broad flat, depressed rather obtuse at the apex, almost entirely concealing the scutellum; median carina obscure. Basal half of tegmina except a narrow area along the claval suture thick, opaque, strongly punctate; venation of this area obscure; apex together with the narrow area along the claval suture semi-transparent, venation in this area distinct; five apical cells; three discoidal cells, the outer two nearly equal in size, the inner more elongate. Hind wings with four apical cells. Legs rather slender, hairy; the posterior tibia with two rows of obtuse denticles.

Type of genus *Brachycentrus punctatus* n. sp.

Brachycentrus punctatus n. sp. (Figs. 5, 6.)

This species may be readily distinguished from *hirsutus* by its larger size, more elevated pronotum which is more distinctly punctured, and less hirsute body.

General color pitchy black, varied with pale yellow. Head pitchy black, rugose; vertex nearly twice as wide as the median length. The clypeus produced into a distinct snout-like process. Antennal ledges strongly produced, beak reaching the posterior coxae. Ocelli, far apart, about their own diameter from the basal margin. Pronotum well elevated, deeply punctured, median carinae obscure, lateral angles produced, the dorsal area with three globose elevations caudad, posterior process strongly depressed. Scutellum broad flat almost completely concealed by the posterior process, reaching to about the middle of the posterior process. Venation of the wings typical, basilar area opaque, strongly punctate. The veins on the apical area obscurely irregularly punctate, not hirsute; punctures pitchy black, the areas between irregularly paler. The ventral part of the thorax and the abdomen pitchy black, densely punctured, the punctures on the ventral part of the thorax and the ventral part of the abdomen irregularly placed; these areas densely clothed with pale yellow pile. The punctures on the dorsal part of the abdomen run in regular rows without pile. Legs slender; coxae and trochanters pitchy black; femora pitchy black at the base, yellowish apically; tibia and tarsi yellowish ochre washed with darker, the spines and the claws blackish; all the legs densely clothed with long pale yellow hairs.

Length, ♀ 3.90 mm.; ♂ 3.40 mm.

Holotype ♂, Pico Turquino, July 22, 1922, S. C. Bruner and C. H. Ballou. Allotype ♀, Pico Turquino, July 22, 1922, S. C. Bruner and C. H. Ballou. Paratypes, one ♂ and one ♀, Sierra Maestra, July 10 to 20, 1922, S. C. Bruner and C. H. Ballou, between 3,500 and 4,300 feet.

Brachycentrus hirsutus n. sp.

This is a smaller and more depressed species than *punctatus*, with the head, pronotum and base of wings clothed with long pile.

Head elongate, the vertex including clypeus nearly as long as the width between the eyes; general surface not rugose, closely punctured and densely clothed with whitish pile; general color blackish. Pronotum broad depressed; the humeral angles not much produced; the apex barely sinuate, but much flattened and distinctly carinate. Whole surface densely and uniformly punctate and clothed with pale yellow pile; general color pale yellowish brown, more or less clouded with blackish especially on the metopidium. Scutellum small. Base of the tegmina opaque, densely punctate and clothed with elongate pile; apex semi-transparent with distinct venation which is irregularly punctate. Whole ventral surface including the femora blackish; tibia brownish; tarsi darker.

Length to apex of tegmina 2.61 mm.; width across humeral angles 1.38 mm.

Holotype ♀, Camagüey, July 30, 1923, on *Bacida buceras* Linn., J. Acuña; Paratypes two ♀ ♀, Camagüey, July 30, 1923, on *Bucida buceras* Linn., J. Acuña.

Tolania punctata n. sp. (Figs. 18, 19, 20.)

This species is somewhat anomalous in the genus *Tolania* Stål. It differs principally in having a much more elongate face, much more prominent humeral angles, much less prominent dorsal horns, much more elevated prothorax, much more acute scutellum and distinctly punctate venation.

Face elongate with the clypeus as long as the width between the eyes; clypeus distinctly trilobed, prominent; antennal ledges prominent; ocelli nearer the posterior border; median sulcus deeply impressed caudad; general color of the face yellowish testaceous, clouded with blackish fuscous, and densely clothed with golden pile. Prothorax well elevated, higher than the width of the face between the eyes; humeral angles obtusely prominent; lateral horns represented by lobe-like carinate prominences; dorsal crest strongly elevated, sharply carinate, posterior border truncate, general color yellowish testaceous, more or less clouded with blackish fuscous, carinae distinctly blackish; the whole surface uniformly but lightly punctate and clothed with golden yellow pile. Scutellum as long as broad, anterior portion globose, posterior portion flat and acuminate; general color golden yellow with the lateral angles broadly fuscous, and clothed with scale-like pale yellow pile. Tegmina whitish semi-opaque; basal third distinctly punctate, each puncture bearing a bristle; venation of the apical two-thirds distinct, the veins sparsely dotted with blackish points. Venter of the thorax fuscous, densely clothed with whitish pile. Coxae, trochanters and femora fuscous; tibiae and tarsi yellowish testaceous, ringed with fuscous. Abdomen pale yellowish testaceous.

Length to apex of tegmina 3.35 mm.

Holotype ♀, Camagüey, December 9, 1921; paratypes two ♀ ♀, Camagüey, July 15 to 18, 1923, J. Acuña.

While this species does not seem to belong to *Tolania* it is perhaps better to assign it to that genus until more specimens are at hand.

Beris quadridentata Walker (Stratiomyiidae, Diptera).—In the British Museum there are several specimens under this name. Two specimens, a male and a female, have been selected as the types. These however are not conspecific. The male is *Beris viridis* Say, having four scutellar spines, as indicated by the specific name, but the female specimen, also bearing a type label, has six spines. The synonymy noted above, pointed out by Osten Sacken (Catalogue, page 44) makes the generic designation *Allactina* Curran (Can. Entom., 56: 24) a synonym of *Hemiberis* Enderlein (Mitteilungen Zool. Mus. Berl., 10: 209).—O. A. JOHANNSEN, Cornell University, Ithaca, N. Y.

STUDIES OF NORTH AMERICAN AEGERIIDAE (Lepidoptera).

By George P. Engelhardt, Brooklyn Museum.

II.

Descriptions of Two New Western Species.

Synanthedon albociliata n. sp.

Male: Antennae lacking, excepting small basal portions which are black. Palpi above black with tips entirely so; below snowy white, this color extending over the coxa and trochanter of the forelegs. Head black, hairy above intermixed with a few white hairs. Collar narrow, dull white. Thorax black with a lateral fringe of coarse, white hair above and of white scales below the base of wings. Abdomen black with a scattering of white scales on the fourth segment dorsally and with the fourth, fifth and sixth segments white ventrally. Anal tuft black above, mixed with sordid white below. Femora and tibiae of hindlegs densely clothed with coarse hair, black and sordid white intermixed; tarsi sordid white. Broad costa, outer and inner margins and large discal mark of forewings deep black, the clear spaces between the veins suffused with white reflections; cilia white. Hindwings transparent with faint reflections of white; veins and narrow margins black, cilia white; underside of forewings heavily shaded with white scales. Alar expanse, 18 mm.

Female: Antennae black with steel blue lustre. Thorax with two narrow, lateral stripes, yellowish white. Abdomen black with posterior half of fourth segment yellowish white. Anal tuft, ventral parts of abdomen and hindlegs all black. Forewings heavily shaded with black, streaked with white along the inner margins and before the discal mark. Cilia brownish black. Hindwings transparent between veins and broad margin which is black. Otherwise like the male. Alar expanse, 20 mm.

Habitat: Kerrville, Texas, October, 1916.

Foodplant and habits not known. Mr. H. Lacey, the collector, since removed from Texas, reported that the specimens were taken among some weeds on his ranch. This, together with the lateness of the season, indicates that the species is a rootborer in some perennial plant, possibly one of the Eupatorieae.

Type, male, allotype, female, and two paratypes, females, William Barnes Collection, two paratypes, females, G. P. Engelhardt Collection at the Brooklyn Museum.

Synanthedon auritincta n. sp.

Male: Antennae black with a small white area on upper surface near the tip. Palpi black above, pale yellow below, excepting the third joint which is black. Head black violaceous; front black with a triangular white patch above clypeus and the eyes broadly bordered with white below the antennae. Collar golden yellow above, white at the sides and below. Thorax above black violaceous with two broad lateral stripes and posterior margin golden yellow; below two broad yellow lateral stripes connecting with the stripes above anteriorly but not posteriorly, otherwise white. Coxa and trochanter of forelegs shiny white. Middle and hindlegs outward violaceous black with white annulations at the joints and spurs; inward dusted with white to tibial spurs; spurs white. Forewings transparent, costa, broad apical margin, large discal mark and veins black, slightly violaceous. Cilia dull black. Hindwings transparent, veins black, cilia dull black, gradually shading to white at the base. Under surface of wings same as above, except a yellow dusting on coxa and more slightly on apical margin and discal mark. Abdomen violaceous black with a narrow yellow band on segments 2, 3, 4, 6 and 7. Caudal tuft steel blue, narrowly fringed with white laterally; ventral parts of segments 1 and 2 dusted with white scales which form a narrow band on segments 4 and 5 and lateral spots on segment 7. Alar expanse, 14–15 mm.

Female: Antennae black, usually but not always marked with white near the tip. Palpi golden yellow above, pale yellow to whitish below. Head black violaceous; face black, bordered with white laterally and posteriorly. Collar golden yellow above, pale yellow or whitish below. Thorax black, heavily shaded with golden yellow laterally, anteriorly and posteriorly; ventral parts also heavily shaded with yellow of a paler hue, sometimes white. Coxa and trochanter of forelegs lustrous yellow or whitish, suggesting a bib. Middle and hindlegs golden yellow, except a violaceous annulation between the spurs of tibia and the tarsus which is violaceous and yellow banded at the joints. Forewings transparent; costa, apical margin, discal mark and veins black violaceous; the space between the veins from apical margin to about half the distance to discal mark heavily shaded with golden yellow, discal mark narrowly bordered outwardly and base shaded prominently with the same color. Hindwings transparent, veins, margins and cilia black, excepting the basal part which is yellow. Underside of wings with the costa heavily shaded with yellow, otherwise as above. Abdomen violaceous black with narrow golden yellow annulations on all segments, excepting segments 5 and 7 which are all yellow. Ventral parts greatly suffused with yellow but less so on segments 2 and 3. Caudal tuft golden yellow intermixed with black laterally and at base above and below. Alar expanse, average 17 mm.; range, 12 to 21 mm.

Habitat: Baboquivari Mts., Pima Co., Arizona, August 1–15, 1923 and 1924. O. C. Poling, collector. Described from eleven specimens, two males and nine females, kindly submitted for determination by Dr. Barnes and Mr. Benjamin. The foodplant and habits are not known.

Type, female; allotype, male, and six paratypes, females, William Barnes Collection; one paratype, male and two paratypes, females, Geo. P. Engelhardt Collection at the Brooklyn Museum.

The assumption that here a dioecious species is being dealt with is directly supported only by the locality and date which correspond for all the specimens in hand. Nevertheless so many western species follow along the lines of sexual divergence as do the present examples that it seems preferable to err on the side of conservatism rather than to add to a nomenclature already overburdened with synonymy. The name "*auritincta*" has been suggested by the rich golden luster on the primaries and on the abdominal bands of the females, which should serve to separate readily this species from all others. The arrangement of the abdominal bands of the males also is distinctive, though less easily recognized, especially where specimens are rubbed or discolored.

(Pending the publication of this paper, word has been received from O. C. Poling, the collector, confirming the identity of the sexes of *auritincta* as set forth above.)

Note: Through an oversight, the manuscript for No. II, "Studies of North American Aegeriidae," has not been submitted to the Editor in the sequence which should have been followed and consequently it has been preceded by No. III, published in the Bulletin, vol. XX, No. 4.

A GIANT WATER-STRIDER FROM TONKIN (Hemiptera, Gerridae).[1]

By W. E. China, London, England.

Amongst the Hemiptera collected by the Sladen-Godman Trust Expedition, 1924, is a huge water-strider of the genus *Limnometra* Mayr. This colossal species absolutely dwarfs all the other species of Gerridae in the British Museum and is by far the largest so far described.

Limnometra gigas sp. nov.

♂. Head about one-third longer than the anterior lobe of the pronotum (3 mm.), above dark fuscous to black covered with a fine golden scale-like pubescence, the occipital lobes, a large spot in front and adjoining each eye, a median broad longitudinal vitta and the posterior disc of the vertex obscurely fulvous; below including the bucculae pale ochraceous covered with a rather long white pubescence; rostrum extending onto the base of the mesosternum, pale ochraceous the third joint reaching the hind margin of the prosternum its apical half fulvous and glabrous, the apical joint black and shining; antennae moderately slender, fuscous, dark at the extreme base of the first joint, paler apically the basal joint as long as from the anterior margin of the pronotum to midway between the humeral prominences, second joint rather less than two-thirds the length of the first and much more slender, third joint about three-quarters the length of the first (remaining joint accidentally broken off and lost but was about equal in length to the third and very slender), length of joints: 5.8, 3.4 and 4.5 mm.

Pronotum slightly more than twice as long as wide, not medianly carinate, dark fuscous covered with a fine golden scale-like pubescence, with a median longitudinal line which is yellow and distinct on the anterior lobe but fulvous and obscure on the posterior lobe, also a sinuate fulvous fascia on each side of the anterior lobe behind the eyes which is continued along the lateral margin of the posterior lobe to the humeral prominence; the posterior margin of the pronotum rounded to the form of a parabola of base 5 mm. and median length 4 mm., humeral prominences very distinctly elevated and shining, two obscure shining tubercles on a level with the humeral prominences and placed further from each other than from the latter.

---

[1] Published by permission of the Trustees of the British Museum.

Prosternum pale ochraceous covered between the acetabula with long white hairs, the outer sides of the acetabula fuscous. Mesosternum pale ochraceous covered with a fine white pubescence, the sides below the posterior lobe of the pronotum including the outer sides of the acetabula, dark fuscous with a median longitudinal band of silvery pubescence, a longitudinal area immediately below the humeral angle of the pronotum, fulvous and a short line at the base of the acetabular suture fuscous. Metanotum with the metaphragma pale ochraceous, the sides fulvous with a dark fuscous lateral fascia including a narrow band of silvery pubescence, the outer sides of acetabula fuscous; anterior margin of metaphragma in the middle with a minute brownish pore (*omphalium*).

Hemelytra dark fuscous reaching to the middle of the sixth abdominal tergite. Abdomen above bright orange red with the sixth tergite and the greater part of the middle of each segment of the connexivum fuscous; below angular but not carinate medianly, pale ochraceous the connexivum flavous and bordered interiorly along the lateral longitudinal impressions with fuscous; spines of the sixth tergite dark fuscous extending well beyond the apex of the abdomen, their apices divergent, the posterior margin of the sixth ventrite more or less semi-circularly emarginate between the lateral spines. Legs fuscous the anterior trochanters, the bases of the anterior femora, and the apices of the middle and hind femora flavous; the hind tibiae pale ochraceous except towards their bases; anterior tarsal claws unequal in length, middle femora unarmed.

Measurements: Length from apex of head to tip of abdomen 34 mm. (the spines of the 6th abdominal segment extend 0.75 mm. beyond the tip of the abdomen), from apex of head to posterior margin of pronotum 14 mm. Breadth across humeral angles of pronotum 5 mm., across middle acetabula 7.2 mm. Anterior femur 10.2 mm., tibia 9.2 mm., tarsus 3 mm. Middle femur 42 mm., tibia 40.2 mm., tarsus 10.2 mm. Hind femur 44 mm., tibia 64 mm., tarsus missing.

1 ♂, Tonkin, Thai-Nien, basin of Fleuve Rouge, 1924 (*H. Stevens*). This huge species resembles in some respects *Gerris mikado* Kirk from Japan[2] which Kirkaldy placed in the subgenus

---

[2] It is possible that *G. mikado* Kirk is synonymous with *Limnotrechus elongatus* Uhler (Proc. U. S. Nat. Mus., 19, p. 273, 1897), from the same locality.

Aquarius. The long and slender antennae with the basal joint shorter than the second and third together and the middle and hind femora longer than the body are, however, characteristics of *Limnometra* Mayr. to which genus I have therefore referred this species. In the type specimens of *G. mikado* the antennae are damaged and only the first and second joints are present. In his description[3] Kirkaldy has not given the relative lengths of the antennal joints and he has also omitted to state that the anterior margin of the pronotum is elevated and provided with a conical projection beneath each eye. The middle and hind femora are shorter than the body.

NOTE.—*Gerris mikado* Kirk. cannot be the same as *G. elongatus* Uhler, because: The middle and hind femora are shorter than the body in *mikado*; but the middle are longer than the body and the hind subequal to it in *elongatus*. This character is not mentioned by Uhler in his description, where he merely says: " legs very long."

As to the proper genus to which to attribute these three species, obviously on facies *elongatus* Uhler, although described in *Limnotrechus* is an *Aquarius*; Kirkaldy states his species belongs to this genus also. The latter author has pointed out that the characters separating these two genera fail in *Gerris chilensis,* which forms the passage from *Gerris* subgenus *Gerris* (= *Limnotrechus*) to *Gerris* subgenus *Aquarius* (= *Hygrotrechus*). Hence, while we may as a matter of convenience maintain these subgenera with mental reservations, as a matter of fact, they have no real standing. Further, species intermediate to or partaking of the characters of each genus, may well be anticipated; and such characters may well become of passing importance.—J. D. DE LA TORRE-BUENO.

---

[3] Revue d'Ent. France, 18, p. 89 (1899).

SOME RHOPALOCERA OF EASTERN UNITED STATES, INCLUDING THREE NEW FORMS.

By Waro Nakahara, Tokyo, Japan.

Several noteworthy forms of nearctic Rhopalocera that recently came under my observation are reported upon in the following lines. Three of these are named and described here for the first time.

Lepidopterists are often criticized for naming forms as creating too many names which, according to the critic, have little biological significance. It seems to me, however, that the whole question of the propriety of naming forms cannot be satisfactorily settled, until more is known concerning their genetical relations. It is perfectly possible that the so-called forms may be the expressions of mutation, or of the segreagtion of hybridized characters, representing, in both instances, genetical peculiarities of some sort. On the other hand, varieties which may appear a little more significant at first sight, like geographical races, might in reality mean no more than influences of external factors on the development of superficial characters without involving a modification of the germ plasm. There is no way in which taxonomists could tell fundamental (genetical) varieties from merely superficial ones. It would seem idle, therefore, to try to draw a line between forms that are worthy of names and those that are not. In the meantime, I feel that inasmuch as there are already many form names in Lepidoptera the uniformity of taxonomic treatment alone may justify naming new forms. Since " forms " do exist, with some peculiarities by which they may readily be known, it would seem not illogical that we should continue to list them under appropriate names, at least for the time being.

Papilionidae.

Papilio glaucus canadensis Rothschild and Jordan.

Papilio glaucus canadensis Rothsch. and Jord., Nov. Zool., vol. XIII, p. 586, 1906.

I caught at Ithaca, N. Y., this summer (July, 1925), a single specimen agreeing well with the description of *canadensis* given by Rothschild and Jordan. It was a small female with the black abdominal border of the hindwing broader than the yellow interspace between it and the cell, and the submarginal spots of the forewing, underside, forming a continuous band, only the last two or three spots being separated.

It may be mentioned here that *Papilio glaucus* as it occurs in the vicinity of Ithaca, N. Y., while being essentially referable to the normal form of the southern race, *turnus,* nevertheless show definite tendencies toward *canadensis.* Most of the small-sized specimens show some characteristic of *canadensis,* though some of them are typical of *turnus* colorationally, with narrow abdominal border and separated submarginal spots. Very large specimens with either the broad black border or continuous submarginal spots are not rare.

Pieridae.

Pieris rapae f. *aestivus* Verity.

Pieris rapae gen. aest. *aestivus* Verity, Linn. Soc. Journ., Zool., vol. XXXII, p. 173, 1913.

Pieris rapae rapae, auct.

The name *rapae* has long been applied to the common summer form and the vernal form has been called *immaculata* Cockerell. Coolidge (this Bulletin, vol. XVIII, p. 159, 1923) called attention to the fact that the latter name is superseded by *metra* Stephens. However, according to Verity (*loc. cit.*) who examined the Linnean types of palaearctic Rhopalocera, *rapae* really refers to the spring brood. Verity writes: " The only Linnean specimen bears his label. It is a male of the first brood, with pale grey apical crescent, no discoidal spot, and underside of hind wing suffused with a thick black dusting; presumably Scandinavian. Thus we find that the Linnean nimotypical form of this species is identical with *metra* Stephens (1827) and *immaculata* Fologne (1857), and that it is the summer brood, whose characters are too well known for me to describe them here, which ought to be distinguished by a name; according to my views on the subject I propose that of *aestivus.*"

It is possible that there might be a name that will take priority over Verity's *aestivus,* but this name is used here tentatively to indicate the common summer form.

Colias philodice f. **plicaduta** forma nov.

This form occurs only in females, differing from the typical form of the sex by having no yellow spots in the broad black border of the upperside of forewing. The original spots are very faintly indicated by few yellow scales.

Holotype: ♀, Ithaca, N. Y., July 30, 1923 (W. Nakahara). Paratopotype: ♀, July 16, 1924. Paratype: ♀, Lava, Sullivan Co., N. Y., "June." Holotype has been presented to the Barnes Collection, Decatur, Ill., and paratype is in the same collection. Paratopotype is retained in the collection of the writer.

The disappearance of yellow spots from the black border of the forewing seems to be a tendency found in many species of this genus. The form here described resembles especially closely *Colias hyale polyographus* form *kutsukakensis* Yokoyama from Japan, the usual form of the Japanese butterfly simulating very nearly the normal female of *Colias philodice*.

Colias philodice ab. **inversata** aberr. nov.

> Upperside: the yellow ground color is totally replaced by dark brown, except in the narrow costal area of forewing and the anal area of hindwing; veins yellow, standing out very clearly on the dark brown ground. Underside: basal two-thirds of forewing suffused with dark brown with yellow veins, as on the upperside. Otherwise same as the typical form.

Holotype: ♂, Millvale, Allegheny Co., Pa., August 20, 1893. "Presented by Mr. C. E. Brunner." Type in the Barnes Collection.

This very striking aberration may be said to be the opposite of aberr. *rothkei* Reiff., which has black veins on yellow background.

NYMPHALIDAE.

Basilarchia arthemis albofasciata (Newcomb).

Limenitis ursula var. *albofasciata* Newc., Psyche, vol. XIV, p. 20, pl. III, fig. 6, 1907.

Basilarchia astyanax form *albofasciata* Barnes and McDunnough, Cont. Nat. Hist. N. Amer. Lepid., vol. III, p. 102, 1916.

Basilarchia arthemis albofasciata Nakahara, Bull. Brooklyn Ent. Soc., vol. XIX, p. 170, 1924.

I have previously stated (*loc. cit.*) that *albofasciata* constitutes a race in the vicinity of Ithaca, N. Y., being the principal representative of the species *arthemis* there. Occasional companions of the typical *albofasciata* in this locality are small specimens agreeing with the northern race, *B. arthemis arthemis,* and a *proserpina*-like form with greatly reduced white markings. This latter might be regarded as a transition to form *atlantis* Nakahara.

Just where the boundary lines between the races *arthemis, albofasciata* and *astyanax* occur is an interesting problem to be worked out. I have recently examined a series of specimens from Hancock, N. Y., and these were all typical *arthemis.* Probably *albofasciata* does not occur in the Catskills.

An interesting specimen of *albofasciata* which I caught this summer at Ithaca may be mentioned here in passing. It is typical of the race, except that it has a white spot, measuring about 1 x 2 mm. in the discal cell of forewing, upperside. The position of this spot is that of a similar spot found in other species of *Basilarchia.* This form may remain unnamed for the present.

LYCAENIDAE.

Everes comyntas ab. **watermani** aberr. nov.

> Very similar to the typical form on the upperside, except that the black borders of both wings are slightly broader. Underside: the postdiscal series of black spots of forewing greatly enlarged and elongated transversely, almost running into the submarginal series of spots; the two black spots near the base of hindwing much enlarged and so also are the black spots of the postdiscal series; of these latter spots the first one from the costal margin is the largest, the second spot being slightly smaller. The enlarged spots are encircled with obscure white rings; none of the spots are confluent.

Holotype: ♂, Ithaca, N. Y., July 4, 1925 (W. Nakahara). Type has been presented to the Barnes Collection.

This is the first aberration to be described under the species *comyntas,* although similar forms have been known in other species of Lycaenidae. It is named after Mr. and Mrs. George Ray Waterman in remembrance of many pleasant summers I spent as a guest at their cottage by Cayuga Lake.

In conclusion, I wish to express my thanks to Mr. Foster H. Benjamin for his kind help in the study of the new forms described in the foregoing lines.

A NEW RHINACLOA AND THREE NEW SPECIES OF LEPIDOPSALLUS (Hemiptera, Miridae).[1]

By Harry H. Knight, Ames, Iowa.

Rhinacloa subpallicornis n. sp.

Distinguished from *forticornis* Reut. by the largely pale second antennal segment and the more translucent hemelytra, but without a paler area at base of corium and clavus; the red color in cuneus and apex of embolium combined with the semi-translucent hemelytra give this species the aspect of a *Lepidopsallus,* but the antennal characters are those of *Rhinacloa.*

♂. Length 2.6 mm., width 1.03 mm. Head: width .71 mm., vertex width at base .28 mm., width between eyes across frons .26 mm. Rostrum, length .90 mm., scarcely attaining posterior margins of intermediate coxae, yellowish, apex blackish. Antennae: segment I, length .143 mm., thickness .071 mm., black; II, .68 mm., thickness .086 mm., cylindrical, somewhat constricted at base, pale yellowish, apical one-third blackish, clothed with fine yellowish pubescence; III, .20 mm., slender, pale; IV, broken. Pronotum: length .43 mm., width at base .91 mm.

Head and body dark fuscous to black; hemelytra pale fuscous, semi-translucent, cuneus and apical area of embolium with hypodermal red; one specimen with hemelytra nearly entirely reddish; membrane uniformly light fusco-brownish, veins red about smaller areole, membrane sparsely clothed with silvery scale-like pubescence which appears to be a continuation of that on corium and cuneus. Legs black, front coxae, trochanters, and apices of front femora pale; tibiae pale, spines black with blackish spots at base; tarsi pale, apices fuscous. Dorsum, pleura, and sides of venter clothed with silvery scale-like pubescence and intermixed with brownish and black simple pubescence.

♀. Length 2.5 mm., width 1.03 mm. Head: width .64 mm., vertex .34 mm.; eyes much smaller than in the male. Antennae: segment I, length .13 mm., thickness .057 mm.; II, .53 mm., slender at base and rather distinctly clavate on apical one-third, thickness .072 mm., pale, the clavate portion blackish; III, .28 mm., slender, pale; IV, missing. Pronotum: length .41 mm., width at base .91 mm.

---

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

Holotype: ♂, Nov. 18, 1924, Dunedin, Florida (W. S. Blatchley); author's collection. *Allotype:* ♀, Biscaine Bay, Florida (Mrs. A. T. Slosson); author's collection. *Paratypes:* ♂ ♀, taken with allotype. ♂ ♀, March 22, 1922, M. Haven, Florida (W. S. Blatchley).

A remarkable character of this species is the presence of silvery, scale-like pubescence on the wing membrane, which I have seen in no other Mirid. No doubt scales occur on the wing membrane of other species but the delicate nature of these deciduous scales would usually cause their loss when collecting the specimens.

The genus *Lepidopsallus* Knight appears to be closely allied to *Rhinacola* Reuter, but this latter genus may be separated by the thicker antennae of both sexes, antennal segment II of the female being rather distinctly clavate while in the male segment II is more cylindrical but greatly thickened, exceeding the thickness of segment I.

Lepidopsallus miniatus n. sp.

This species runs to *olseni* Kngt. in my key to the species of Lepidopsallus (Hemip. Conn., 1923, p. 470), but differs in the reddish color and relative length of antennal segment II; coloration suggestive of *rubidus* Uhler but the antennae uniformly pale and segment II distinctly longer; length of segment II distinctly greater than width of vertex plus dorsal width of an eye.

♀. Length 2.8 mm., width 1.5 mm. Head: width .77 mm., vertex .36 mm. Rostrum, length 1.06 mm., reaching to middle of posterior coxae, yellowish brown, basal and apical segments darker. Antennae: segment I, length .17 mm.; II, .69 mm.; III, .33 mm.; IV, .23 mm.; pale yellowish, the apical segment scarcely dusky. Pronotum: length .58 mm., width at base 1.23 mm.

Coloration reddish to reddish brown, nearly as in *rubidus* Uhler, calli darker, sometimes the pronotum and scutellum distinctly dark fuscous; one specimen very dark, the pronotum and scutellum ferruginous; cuneus uniformly translucent red, the corium and embolium of nearly the same shade; membrane fusco-brownish, veins becoming red. Legs reddish, front coxae fuscous at base, apices of femora and the tibiae pale; tibial spines dark, with fuscous spots at base but becoming obsolete on apical half; tarsi pale, fuscous only at extreme tips. Ventral surface yellowish to red, sternum fuscous to black. Clothed with silvery white scale-like pubescence as in *rubidus* and intermixed with yellowish to fuscous simple pubescence.

Holotype: ♀, March 23, 1921, Dundedin, Florida (W. S. Blatchley); author's collection. *Paratypes:* ♀, topotypic. ♀, South Carolina (Mrs. A. T. Slosson).

Lepidopsallus ovatus n. sp.

Allied to *miniatus* but smaller, more ovate, and head broader, with antennae pale but relatively shorter; antennal segment II barely equal to width of vertex plus dorsal width of an eye.

♀. Length 2.6 mm., width 1.55 mm. Head: width .77 mm., vertex .37 mm. Rostrum, length 1.03 mm., just attaining middle of hind coxae, yellowish, basal segment dark reddish, apical segment blackish. Antennae: segment I, length .143 mm.; II, .57 mm.; III, .32 mm.; IV, .23 mm.; uniformly pale yellowish, segment IV only slightly dusky; segment II just equal to vertex plus dorsal width of an eye. Pronotum: length .54 mm., width at base 1.16 mm.

General coloration reddish yellow, somewhat shining, hemelytra semi-translucent, pronotum piceous but basal angles more reddish, scutellum dark with lateral margins reddish yellow; head piceous, vertex pale bordering eyes; hemelytra reddish translucent, but becoming blackish on outer apical half of corium, cuneus uniformly reddish translucent; membrane uniformly pale fuscous, veins scarcely reddish. Ventral surface, coxae, and basal half of femora, piceous, shining; tibiae, tarsi, and apical one-fourth of femora pale, tibial spines black, fuscous points barely visible at base of spines on hind pair. Clothed with silvery white, scale-like pubescence, more thickly on pleura and sides of venter, intermixed on dorsum with simple yellowish pubescence.

Holotype: ♀, May 3, 1924, Tucson, Arizona (A. A. Nichol); author's collection.

Lepidopsallus pusillus n. sp.

This species runs to *olseni* Kngt. in my key to the species of the genus, but is readily distinguished by the yellowish ground color darkened with fuscous and the semi-translucent aspect of the hemelytra.

♀. Length 2.2 mm., width 1.03 mm. Head: width .63 mm., vertex .30 mm. Rostrum, length .85 mm., reaching to middle of hind coxae, yellowish, apex fuscous. Antennae: segment I, length .13 mm., yellowish; II, .51 mm., gradually thickened toward apex where it equals thickness of segment I, blackish, the middle one-third yellowish; III, .31 mm., pale; IV, .23 mm., pale to dusky. Pronotum: length .41 mm., width at base .86 mm.

General coloration pale to yellowish and darkened with fuscous; head yellowish, vertex becoming infuscated; pronotum yellowish, the disk rather evenly infuscated except anterior margin and basal angles, scutellum dark fuscous; hemelytra pale yellowish translucent, inner half of corium and apical area of clavus pale fuscous, cuneus with apical half of membrane margin fuscous; membrane pale fumate, darker on veins. Ventral surface yellowish, becoming dusky on sternum and sides of venter. Legs pale, hind femora yellowish, anterior aspect showing many small, nearly obsolete fuscous dots, provided with a single subapical spine near dorsal margin which in length equals the tibial spines; tibial spines black, prominent, those on basal half set with fuscous dot at base of each. Clothed with rather prominent fuscous, simple pubescence, and sparsely intermixed on dorsum with silvery scale-like pubescence.

♂. Length 2.4 mm., width 1 mm. Head: width .68 mm., vertex .26 mm. Antennae: segment I, length .16 mm., yellowish; II, .67 mm., yellowish, apical one-third fuscous, clothed with fine fuscous pubescence, a few fine hairs in length equaling thickness of segment; III, .29 mm., dusky; IV, .20 mm., dusky. General form more slender than the female but coloration very similar.

Holotype: ♀, July 4, 1918, Gainesville, Florida (C. J. Drake); author's collection. *Allotype:* ♂, Dec. 15, 1913, Dunedin, Florida (W. S. Blatchley); author's collection. *Paratypes:* ♀, Dec. 17, 1920, 4 ♀, Nov. 19, 1924, Dunedin; ♂, April 6, 1925, Royal Palm Park, Florida (W. S. Blatchley).

Note on Pieris rapae and Brephos infans.—A male *P. rapae* was taken by me in Fall River on March 21, 1925, which is rather an early appearance for southern New England. I have never seen it on the wing before April on previous seasons of which I have record. Male *Brephos infans* started appearing in numbers in the last week in April. Two males were taken on March 22.—W. Prescott Rogers, Fall River, Mass.

HINTS ON MOUNTING LEPIDOPTERA.

By William C. Wood, New York.

The editor has suggested that I jot down some points in connection with the spreading of Butterflies. I am no authority on this subject, but there are a few things which my experience has shown to be useful to me, and this short paper may, as someone has expressed it, be of a certain interest as showing " how the other fellow does it."

Freshly killed specimens are usually easier to handle than " papered" material. Small specimens which have died with the wings reversed are sometimes obstinate objects. I have made a wooden stand, illustrated below (Fig. 1), which often simplifies the problem. A No. 1½ or No. 2 pin is thrust through the thorax, between the legs, and the specimen placed upon one end of the central " fin " of the stand, with the pin lightly piercing the wood to hold it in place. Then the points of a pair of thin flat straight forceps are inserted, slightly separated, between wings and body, with the pin between them. Next the forceps are allowed to separate gradually, the while they are gently pressed downwards. This first spreads the wings and then closes them together in their natural position. Next, the pin is withdrawn, the body of the specimen taken between thumb and finger of the left hand while the forceps are withdrawn. The specimen is now in the usual position for pinning. A slight squeeze, to fix the wings in the normal position, is desirable.

I use heavy paper to hold the wings on the setting board, a single slip for each wing. When the specimen is a large one (50 mm. or more in expanse) I use another device preliminary to placing the paper strips. This is shown in Fig. 2. It is made from a brass hairpin cast into a leaden weight as shown. After pinning the specimen in the groove of the setting board I gently separate the wings, if approximated as usual, with the flat forceps, and lay upon them the wire prongs of the little device. This holds them flat upon the board, but as the tips of the prongs are bent downward a trifle, the wings can be moved without rubbing. I then adjust and fasten all four wings with setting needles. Finally the paper slips, one to each side, are slid under the prongs if these are in the way, and secured by glass headed steel pins (which can be had at any notion counter), the little device is lifted off and the operation is over except for the adjustment of the antennae. (Figure 3.)

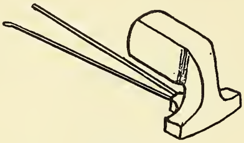


Fig. 2

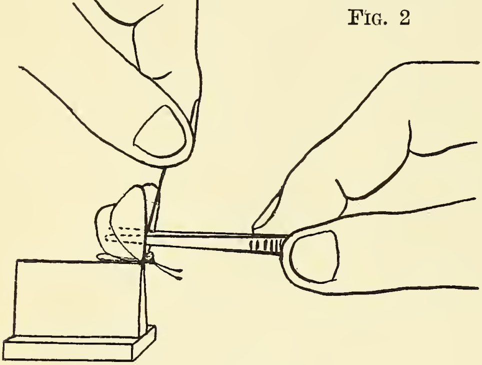


Fig. 1

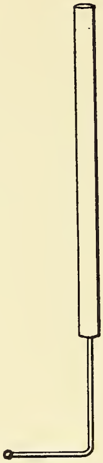


Fig. 4

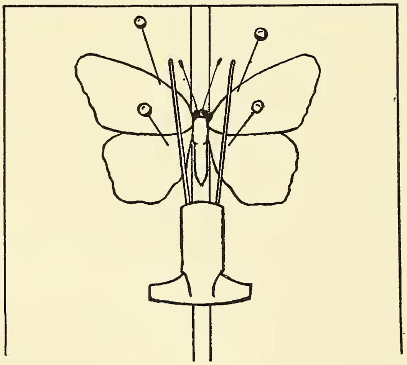


Fig. 3

For small specimens I use, to adjust the wings, the little tool devised by Dr. Henry Skinner (Fig. 4), than which I know of nothing better. It is simply a regular insect pin (about No. 3) bent at a right angle one-half inch from the head, and the point inserted in a wooden handle, preferably a trifle thicker than those of setting needles. When the insect is pinned in the groove of the setting board this little tool, held in the left hand, is inserted between the upright wings, and those of one side gently pressed out until flat upon the board. Held flat by the angled end of the tool they are adjusted by setting needles, which usually hold them flat in place until the same operation has been done on the other side, when paper strips are applied and pinned.

Hesperids, especially if papered material, are sometimes so obstinate that the hind wings cannot be drawn forward without tearing them. With such I cut the muscle of the hind wing with a very small sharp scalpel (what is known as a cataract knife is good). Holding the specimen between thumb and finger of the left hand I pass this knife, held in the same plane as the wings, between abdomen and secondary, pushing it gently forward until it brings up at the attachment of the wing. Then firmly but carefully, with a controlled movement, sever the tendon. A little practice teaches one to feel when he has cut just far enough and not so far as to amputate the wing. Treated thus Hesperids are spread as easily as Pierids.

Specimens which have been papered are almost sure to dry out loose on the pin. On removing them from the setting board I push them up the pin a short distance, applying the forceps beside the pin under the thorax, and touch to the pin a drop of shellac, just under the thorax. Then push the specimen down to its proper level. This permanently prevents swinging on the pin.

The wings of the smaller Noctuid moths have a habit of drooping or rising a few months after mounting. I have been told that this may be prevented by the application of a touch of shellac at the juncture of the wings and the thorax on the under side, when the specimens are lifted from the setting board. I have not tried this long enough, as yet, to be sure of its efficacy.

Hylephila phylaeus Drury.—This Hesperid butterfly, so abundant in the South, occurred in much greater numbers than usual at Flushing, New York, during the latter part of July and throughout August and September, 1925. A single female was seen by the writer at White Plains, New York, on August 16, 1925.—E. L. Bell, Flushing, N. Y.

EXCHANGES.

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

BUTTERFLY COLLECTORS.—Have you aberrations or freak butterfly specimens for sale or exchange? Professional and private collectors please write. Jeane Gunder, Pasadena, Calif.

NEW ARRIVALS.—From Colombia, French Guiana, and Brazil. Brilliant tropical Lepidoptera for scientific and decorative purposes. H. S. Parish, 81 Robert St., Toronto, Ont., Canada.

ARKANSAS INSECTS.—Am again collecting. Have Lepidoptera on hand. Miss Louise Knobel, Hope, Ark.

CORRESPONDENCE INVITED from all those interested in Hungarian Insects—Coleoptera, Lepidoptera, Hymenoptera, Hemiptera, etc.—Prof. Charles Sajo, Oerszentmiklos, (Comitat Pest), Hungary.

CYNIPIDAE.—Galls and bred wasps wanted to determine or in exchange. Alfred C. Kinsey, Indiana University, Bloomington, Indiana.

WANTED.—Am studying the bionomics of the corn billbugs and desire the privilege of examining *Calendra* (*Sphenophorus*) from all parts of the world. A. F. Satterthwait, U. S. Entomological Laboratory, Webster Grove, Mo.

WANTED.—Pentatomidae, Cydnidae, and Scutelleridae from all parts of the United States for determination or exchange. Dayton Stoner, State University of Iowa, Iowa City, Iowa.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Southwest Museum, 4699 Marmion Way, Los Angeles, Calif.

WANTED.—Ants from all portions of the United States for determination or exchange. Will also exchange other insects for ants. M. R. Smith, Assistant Entomologist, State Plant Board, A. and M. College, Miss.

MISSISSIPPI INSECTS.—Will collect in all orders. Correspondence solicited. Miss Sophie May Newbern, Cedar Bluff, Miss.

WANTED.—Records N. Y. State Rhopalocera for check-list, all species and localities desired for a table showing the distribution throughout the State. James L. Angle, Librarian Rochester Municipal Museum.

Wanted--Butterfly Aberrations

If you or your friend find an oddly marked or colored butterfly, I would like to hear about it.—These kinds of freak butterfly specimens are my personal hobby, and I am not a dealer.—If you are selling your collection, it is better to dispose of those specimens separately, to realize more.—Correspondents always promptly answered.

JEANE GUNDER, Pasadena, California

COMSTOCK'S

Introduction to Entomology

The complete work includes Part I as issued in 1920, *revised* and Part II, devoted to the classification and the life histories of insects.

$6.00 Net

About 1044 pages 1228 Illustrations

Buckram Cloth Binding

THE COMSTOCK PUBLISHING COMPANY
ITHACA, NEW YORK

List Nr. XIII
Gratis on Request, text English

All prices net in U. S. dollars. Contents **Lepidoptera, Coleoptera and other insects,** books, pins, etc.

Original Collection of Fassl: Heterocera (also Agrias) with many rarities, single ♀ ♀, types, etc.

We have the greatest store in the world of Lepidoptera, Coleoptera and other insects.

Dr. O. Staudinger & A. Bang-Haas
Blasewitz, Dresden, Germany

Rare Tropical Butterflies

Especially Ornithoptera ♂ and ♀, Morpho ♂ and ♀, Agrias ♂ and ♀. Papilios from Madagascar, Australia, So. America, India, etc. Many species of Caligo, Prepona, Chlorippe, Ancyluris, Helicopis, etc. Urania ripheus.

Send for Price List.

Hal Newcomb
804 Elizabeth St.,--Pasadena, California.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.

Manufacturers of the genuine Schmitt boxes, exhibition cases and cabinets; also of the American Entomological Co. insect pins.

Our supply catalog No. 41 will be sent free on application, also the following lists:

147 Butterflies for trays,
192 All glass mounts,
205 North American Lepidoptera,
249 Exotic Lepidoptera,
212 Insect pests, Summary of collections,
213 Exotic Coleoptera,
214 North American Coleoptera,
234 Insect collections,
229 Life histories of insects,
254 List of living pupae.

PUBLICATIONS OF THE BROOKLYN ENTOMOLOGICAL SOCIETY.

Explanation of All Technical Terms Used in Entomology. By John B. Smith, Sc.D. (The Glossary) Cloth	$3.00
Bulletin of the Brooklyn Entomological Society (unbound), vols. 4–8 (per vol.)	1.75
Vols. 9–14	1.25
Vols. 15 to date	1.50
Entomologica Americana, vols. 1–6, each	2.50
Papilio, vols. 1 and 4, each	3.00
Monograph of Plusia, Ottolengui	.50

Orders for publications must be sent with remittance to Librarian, Brooklyn Entomological Society, c/o Central Museum, Eastern Parkway, Brooklyn, N. Y.

37

1317

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01262 6628